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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries

METALS NON-METALS PETROLEUM

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"THE years ahead of us will be the most solemn in our history. The heart of the world has been stirred, by social, political and economic wrong and inequality. Our institutions are again to be put to the test, to a full test of their righteousness. They have survived all tests for 150 years, and if in these next few months we can preserve the spirit of Theodore Roosevelt, they will yet survive.

"We are in one of those times of hysteria, of extremists, both in politics and in economics. We are oppressed with phrase makers, who would solve our national policies with phrases—Bolshevism, Socialism, trades unionism, internationalism, capitalism, and a hundred others. Either government or gospel by isms or phrases is the negation of straight thinking. . . .

". . . We have got to go deeper if we are not to be dominated by the imported disintegrating social theories of Europe. We must diagnose the roots and the causes of this infection. We must impose a constructive social hygiene of our own, and, if need be, we must impose a surgical operation. That social ideal that we now need lies deep in the heart of the American people. It is the social ideal of Theodore Roosevelt. It is the simple ideal of equality of opportunity."

—*Herbert Hoover*, Oct. 27, 1919.

The War-Minerals Relief Commission

IT IS NOW nearly a year since the appointment of the War-Minerals Relief Commission, to carry out the act of Congress appropriating a maximum of $8,500,000 for the relief of producers of war minerals who began production for war purposes at the request or demand of the Government. The matter was placed in the hands of Secretary Lane by Congress, because Congress had found that a Congressional claim committee never finished its work—at least that was what was stated on the floor of the House and in committee. About four months after the committee had begun its work, an informal estimate was made to Secretary Lane that under ideal conditions, and with arbitrary methods, the job might be terminated in two years; but on the rate already established (with careful and courteous methods) the mathematically correct but actually humorous estimate was 300 years.

At present, out of 1,203 claims, 462 have been eliminated as not showing specific "request or demand" according to the limitation inserted by Congress. Forty-seven claims have been allowed in part up to Jan. 31, leaving 694 to be expedited. As the 462 claims were eliminated automatically, the forty-seven claims represent most of the actual labor; and on this basis we may make a recalculation that the completion of the work will take fourteen years. By comparing the estimate of six months ago of 300 years with the present one of fourteen years, however, it will be seen that we are plotting a curve which will naturally culminate in far less time than our figures indicate. As a matter of fact, another year should see the bulk of the work accomplished.

Let us not be understood as criticising the commission. The commission was composed of sound men; and they were given a job that would have appalled any but the stoutest-hearted. It was evident from the beginning that it was impossible to discharge such a job amid universal plaudits. It has not proved difficult for the engineers and auditors of the Bureau of Mines to ascertain the facts expeditiously and accurately. Though only forty-seven valid claims have been passed on by the commission, complete auditors' and engineers' reports are available for many more; and this investigative phase could be speeded up if necessary.

Much of the delay incurred by the commission is due to the claimants themselves; and the hundreds of waiting claimants should understand this. Certain claimants, with their lawyers and expert witnesses, demand repeated and long hearings, and argue their cases with all the pomp and ingenuity of a court proceeding; and the commission does not see its way clear to deny claimants hearings to their complete satisfaction. So long as this courteous and considerate attitude of the commission lasts, the hundreds of waiting claimants may figure on waiting; and it would be difficult to point out how the commission could do otherwise, except at the express direction of the Secretary.

The Chestatee Pyrites Co. is a case in point. This company had its claim in as No. 1; and has taken altogether several weeks of the commission's time. After the final decision of the commission, this company obtained rehearing with the solicitor of the Interior Department, then with the Secretary; and having exhausted the possibilities of the Interior Department, the company has taken its case to Congress, where the commission is summoned to go into matters *ab initio;* and in Congress they testify that the commission asked five minutes of Commissioner Philip N. Moore, which he refused! We can well appreciate the figure of the last straw.

Two Interior Department decisions are under fire by

claimants in the House committee hearings. One is that the Government is responsible only for losses incurred *after and as a consequence* of the Government influence.

The Chestatee company was well under way in its pyrites enterprise when Secretary Lane's message for increased production was brought to it. Already (previously) it had advised Government officials that it was proceeding as rapidly as possible in the construction of a power plant, mill, railroad, and other necessary work. When the Government later manifested a willingness to co-operate, the company asked for assistance in building a wagon road, which was given; but the wagon road was never completed and used. Instead, the company proceeded with its railroad construction, without consulting the Government; and it now asks for complete reimbursement therefor. In financing its installation, also, it agreed to pay to the financier as commission a very high royalty of so much a ton on several hundred thousand tons of ore, as produced. This commission would have amounted, if received, to well over 100 per cent; but the ore has not been produced; will, in the judgment of Government engineers, never be produced; and, even if produced, could be brought forth only in future years; but the Chestatee company insists on full cash payment of this commission now by the Government, as part of its claim. These things explain in part why the company has been awarded something over $200,000 by the Secretary out of a claim of over $900,000; and, having exhausted the field of the executive branch, it is bringing its unusual talents to bear anew on the legislative.

Another decision is to the effect that a claimant's case is to be considered not solely on the basis of a single period, or a single operation, but on his war-time operations in the industry in question. One company which operated profitably all through the war up to the time of the armistice sent in a claim for loss on its last shipment of ore, which remained unsold on account of the declaration of the armistice.

One of the principal critics of the commission before the House committee is known to have made profits out of the chrome business before the date fixed as his having received the "request or demand of the Government." He kept on with his production, and showed a net loss between this period and the date of the armistice. He refuses to show his books for the period previous to the "request or demand."

Finally, matters would move more promptly if the members of the House Committee on Mines and Mining familiarized themselves privately with the history of the matter under investigation. Some members of this committee frankly stated in hearings their complete ignorance of the legislative and executive history of the War-Minerals Relief Act; and the result is the dragging and desultoriness of these hearings. If their secretaries would secure dispassionate digests of the matter, and they would master these digests, the business would be expedited at that end.

The Stevenson Bill

LEST we forget the many young mining engineers who have been disabled while in performance of duty as engineer officers in the U. S. Army during the war, we call your attention to the Stevenson bill, H. R. 10835, which provides "That any officer who has served in the military forces of the United States during the war with Germany, and who does not belong to the Regular Army, and who incurred disabilities while in the service during the said war, shall be entitled to the same compensation as like officers in the Regular Army receive on being retired for an equal disability."

We believe the provisions of this bill are right and just. We think that every citizen who feels grateful for the services of these young engineers, who are now paying more than the average citizens' share for the cost of winning the war, should write to his Congressman and urge his support of the bill, which is designed simply to avoid unjust discrimination and give faithful servants their due.

Under present regulations, an emergency officer ranking as first lieutenant, if he has lost a leg, will draw compensation of not more than $56 a month, whereas a first lieutenant in the Regular Army, with the same disablement, will be retired at $125 per month. In addition to this, the Regular Army officer retains privileges of buying sustenance and stores at the Army commissary at manufacturers' prices, a considerable item in view of the present high prices. Can you see any reason or justice in such a discrimination? During the war all officers were on the same footing as to work, duties, responsibilities, dangers, and risks. All were subject to the same rules and regulations. There was no discrimination among officers in going into action, and all suffered the same hardships, incurred similar wounds, and were disabled by the same diseases. During the war there was only one class of officers, the American Army officer. Surely, after the war any discrimination is inconsistent with our American ideals of fair play.

Substitutes for a bill like the Stevenson bill, to counteract this discrimination, such as war risk insurance, the Sweet bill, and vocational training, do not satisfy the necessities in the case. The Navy retires its disabled reserve officers, the Marine Corps retires its disabled temporary officers, and the Army retires its disabled regular and provisional officers. Why should not the National Army, Reserve, and National Guard officers of the Army receive the same consideration?

The Control of the Metal Market

WE HAVE hitherto been inclined to agree with an opinion frequently expressed, that it would be more satisfactory if metal transactions were all made through an exchange, where transactions could be officially recorded, and the average of each day's sales established, as is done in the stock and bond market, and in the markets for wheat, cotton, and pork. Such an institution would transfer the burden of being the quoter of the most reliable figures from the shoulders of the *Engineering and Mining Journal*. The *Engineering and Mining Journal's* quotations have stood the test of time, of elaborate after-checking, of court decisions and of Government inquiry.

We doubt whether this is an asset to the *Engineering and Mining Journal* in the last analysis. It raises up many unfavorable critics and few friends. We are, of course, glad and proud to be of service, and do not shrink from the responsibility. Therefore, we view the subject from a detached standpoint.

From our first impression of the advisability of a public exchange, we have recently advanced to a different point of view. A public exchange would mean the turning over of the metal industry to middlemen and speculators—and instituting the very condition which is a menace in our economic life, as regards nearly all the necessaries and luxuries. It would mean corners and combinations by influences unseen and unknown, and therefore the skinning and starving of the producer and the consumer alike, for the better clothing and fattening of the parasitic class. That happens in wheat and cotton and pork and wool. That is the general story—but how about metals? Is the price of metals correspondingly inflated? The dollar is worth 42c. as compared with pre-war prices; that is a rough gage in the rise in the costs of metal production. Before the war, if we wished to be conservative, we figured copper at 14c. in valuing a mine. According to that, it should be now 33c. Wheat and cotton and other staple commodities have jumped far more than that proportion, because of the speculative market, which lets in the middleman for his unconscionable rake-off. Copper is selling at 18¼-19c. and was selling at 18-19c. before the war. It goes direct from the producer to the consumer, with no parasite's profit between. Reduced to the pre-war or gold basis, it is selling lower than it has for many years, for 19c. is the equivalent of about 8c. in pre-war money.

We do not for a moment suppose that the great producers who to a large extent control the metal markets are altruistically selling below the natural market price created by supply and demand. They did that at the beginning of the war, as regards copper, and the result was that when there was a question of credit it was given to the bargaining powers of Bernard Baruch, of the War Industries Board; and when there was a question of suspicion, the producers were accused of profiteering. What the producers accomplish is the elimination of the speculators' graft. For their own greater profit, do you say? You and we can judge for ourselves as regards the chief example, copper, at least.

The great copper-producing companies are semi-public institutions—so numerous are the stockholders, and so open their books. As stockholders, we are too sadly aware that they are not fattening. Between low prices of product, high costs of operation, and excessive taxes, they are in a position where efficiency, economy, watchfulness, and kindly patience ought properly to be the watchwords.

It would be easy, theoretically, for the great producers to adopt the methods which have boosted other necessaries, and create a speculative and inflated market, and sudden fluctuations far more profitable than mining and smelting. Would you and we be tempted in such a case? "The Trusts," said the orator, "are growing rich at the expense of the People," and then, overcome by the contemplation of his own picture, "I wish to Heaven I owned one." But the producers are in such a semi-public capacity that they could not conspire if they would, any more than the great iron and steel interests. Always open to Congressional and Administration attack as political capital, they can survive only by the most rigid and transparent methods.

Copper, then, is being handed from the earth to the large consumer with the maximum of efficiency and the minimum of charge. Beyond that, we will not attempt to follow it; but so far as certain public utilities go, which use copper largely in their electric installations, and which are among the direct purchasers from the producers, it appears that it gets to the ultimate consumer at a remarkably low figure, since their fares are at or below cost.

It may be rejoined by many a miner that we have proved too much: that it would be only fair, in a world of profiteers, if the miner were also a profiteer; and thus he would only be even with the rest. Many economists tell us that the present inflated prices will never come down.

If that were true, then, of course, the sooner we get on the bandwagon the better; but we believe that the wagon is on a joy ride, and that a wreck is coming. These economists are false prophets. With the world on a gold basis—or a gold and silver basis—prices must come down.

Farm products are subject to speculation. Extraordinary complaints are coming from the farmer, according to Government sources; the spectacle of the difference between what they get for their produce and what the ultimate consumer has to pay is more than they feel they can suffer, for they know that it is the speculators and the middlemen who are taking most of their produce, and they are tired of working fourteen hours a day to support these fat masters. "It is Bolshevism!" exclaim the Government officials in dismay. It is not: it is good sound Americanism. A remedy should be applied.

In the mining industry we hear little or nothing of real or fictitious Bolshevism, and the reason, as outlined above, is becoming clear to us. The metal industries are, in part at least, on an ideal and bedrock basis, which even the Socialists could hardly show us how to improve. We are getting the little end of it, it is true; especially, the gold miner, who is being robbed, not within the industry, but by the economic chicanery of the rest of the world.

So far, then, from continuing to wish that the metal industry should be handed over to the speculators who are itching to control it, we have come to wish that the other great productive interests would adopt, or be forced, to the same methods. The establishment of great selling and buying organizations for handling eggs (which we believe is the largest single American industry), potatoes, wool, and the other necessaries—organizations prominent enough to be continually subject to Government, and hence to public, inspection—would do wonders to increase our general prosperity and our content.

The solution of our industrial problems is not to be hostile to Big Business, nor try to smash widespread and efficient organizations, which reduce the cost of necessaries to the ultimate consumer; but to consider them, in proportion to their size, more and more in the nature of quasi-public institutions, to be accordingly open to inspection, to make complete reports, and to be regulated when necessary. The American people have about decided this in preference to Government ownership, as regards railroads and telegraphs, and they have long ago abandoned the idea of breaking them into fragments; and the conclusion in regard to them will be found to apply more and more to other basic or key industries, as these organize more centrally and efficiently.

A Plea for the Consideration of a Theory of Solidarity in the Mining and Metal Industry

WE HAVE PURPOSELY made the above title long; but it is not yet sufficiently comprehensive to be entirely clear.

The mining-metal industry needs solidarity to be influential and effective. Organization and unionization is the necessary development of the period; without it, no one pays much attention to sporadic plaints or opinions.

As we survey the field, we note rising from it prominently three groups of organizations—the associations of the profession or industry, the Government organization, and the mining press. In the first group are the American Institute of Mining and Metallurgical Engineers, the Mining and Metallurgical Society, and the American Mining Congress; in the second, the Geological Survey and the Bureau of Mines; in the third, most prominently the *Mining and Scientific Press* and the *Engineering and Mining Journal*. Between members of each group there is in a minor way competition, which may if unwatched develop an outer fringe of jealousy. Inspected more closely, it is seen that each has its separate and useful field, and only the fringes overlap.

The consensus of these organizations would be extremely powerful in national questions pertaining to the industry; it would probably be in most cases determinative. Without cohesion, the influences of one may be neutralized by the other, or weakened by their indifference or inactivity.

We do not suggest common agreement on questions between those different powers—we hold, as the others will, for independent action. But we do make the plea for each to keep always in mind the essential community of interest and rectitude of purpose of the others; and to further hold in mind the power of concerted action, when this is feasible.

Does the Magma Flow Sheet Infringe Minerals Separation Patents?

FLOTATION engineers will be keenly interested in the outcome of the fourth and latest of the Minerals Separation suits against American companies which are, it is alleged, infringing the M. S. patents. If the Magma Copper Co. loses this suit, and no help comes from the present agitation of the American Mining Congress before the Federal Trade Commission, then the various companies will be forced to stand and deliver whatever the patent-exploiting company asks. Previous experience shows that it would be too much, under the circumstances, to expect that its demands in such a case would be tempered with mercy.

The first Miami suit was decided in favor of Minerals Separation, because what was construed as violent agitation took place in Pachuca tanks; the Butte & Superior case went the same way, because the company employed a fraction of 1 per cent of oil; the Nevada Consolidated dispute is still in the courts, but there, also, oil has been the principal agent to secure a froth. In the case of Magma, however, alphanaphthylamine, or "X-cake," is used, the solution being fed into the first Callow rougher cell. No oil is used and no violent agitation; at least we would not consider it such. The chemical is slightly soluble and may come under the M. S. patent on soluble frothing agents. It is, however, a chemical whose use for this purpose was unknown by Minerals Separation at the time the patent was granted, and whose development is due to engineers in no way connected with that concern. These litigations will therefore cover new ground, and it would appear that conditions are as much against the plaintiff as any which can be found.

Transportation De Luxe

AUTOMOBILES, both passenger car and truck, have proved themselves of the greatest value in mining districts, as they have in other lines of industry. They not only serve as a means of communication with otherwise inaccessible districts, but actually compete with the railroads. When in Phoenix we take a car to Ray and allow the local on the Arizona Eastern to proceed unincumbered with our baggage. When the miners and millmen of Kirkland Lake are promised a railroad by the Canadian government they are disgruntled; they want an automobile road instead, and they agitate until they get it.

Seven million cars are running in the United States; one and a half million new ones will be built this year, if all goes well; and forty million tires will be sold, for which over half a million bales of cotton will be required. And it was not so long ago when the one-lunged Oldsmobile was considered a marvel of mechanical ingenuity, and a car which would "get there *and back*," even on a paved street, was so much of a novelty that this phrase was adopted as a slogan.

San Francisco Edition Market Report

WHEN the *Engineering and Mining Journal* was in San Francisco we found it necessary to issue our market report in New York as a separate sheet, as our Eastern subscribers could not wait for the mails from the West. Then there was impressed on us the same delay which our Western subscribers must experience now that we are publishing in New York. Therefore, in moving from San Francisco, we are leaving our market letter there—the same as we have been issuing in New York.

Our entire market report is telegraphed from New York to San Francisco every week, and appears in San Francisco simultaneously with the appearance of the *Engineering and Mining Journal* in New York. We confine the Western service to the Colorado-Texas tier of states, and West to the coast. We have made a selected list of between two and three thousand Western subscribers whom we judge would appreciate this service, and have put these on our San Francisco mailing list. There is, of course, no charge, although the service costs us more than you perhaps imagine. Any Western subscriber who is not on this list and would like to receive this letter may be placed on the list by writing to the *Engineering and Mining Journal*, Rialto Building, San Francisco.

The *Engineering and Mining Journal's* metal quotations are the only ones which are reliable enough to be accepted as a trustworthy basis in business transactions.

WHAT OTHERS THINK

George Washington—Herbert Hoover

Of all the great patriots in a land that is renowned for its unselfish patriotism, there is no man in history that overtops the colossal figure of George Washington.

Washington was an engineer and a wealthy man. The nation called him to the Presidency to guide the Ship of State through the troubled waters of the period following the War of Independence.

The same steady nerves and cool judgment which made Washington a good engineer, coupled with freedom from financial worries, enabled his patriotic soul to render services to his country, the results of which have endured and will endure throughout the ages.

Another great war is ended, another reconstruction period, seething with troublesome cross currents, is upon us, and another great engineer is available for patriotic service to his country.

I venture to say that George Washington was never in greater personal peril, or made less of it, than was Hoover when traveling in Europe after he had run counter to the cherished designs of a number of cutthroat Balkan princes and aspiring Bolsheviks.

Just as Washington refused to accept personal profit either directly or indirectly, for his patriotic achievements, so Hoover has refused reward, directly or indirectly, for his services to his country.

Herbert Hoover has already proved himself great and brave and patriotic in war time, and it is the obvious part of wisdom to retain his services for the period of reconstruction. GEO. J. BANCROFT.

Bancroft Building, Denver, Col., Feb. 6, 1920.

India and the Gold Standard

A dispatch has recently been published in the newspapers stating that the Currency Commission has recommended the adoption of the gold standard for India, and that India is likely to be a gold standard country very soon. This is a misapprehension.

There is still no gold standard in India; but there is and has been a gold exchange standard, which is not functioning properly. The error has arisen as a result of the new regulations of the government of India—based upon the recommendation of the Currency Commission—fixing the amount of gold bullion necessary to purchase a rupee.

Gold imports into India are made by license, the government purchasing all the gold received in the country. From time to time, the government of India has been changing the gold acquisition rate. In August, 1919, the government paid one rupee for every 9.662 grains of gold. From December up to the beginning of this week, it paid one rupee for every 10.273 grains of gold. Now it has raised the rate still further and gives one rupee for every 11.3001 grains of gold. A gold sovereign contains 113.001 grains of gold; consequently 10 rupees equal one gold sovereign. This arrangement has nothing to do with actual exchange transactions from day to day, which vary widely. According to the latest reports, business has been done in Calcutta at as high a rate as 2s. 10d. for one rupee. The exchange rate between the sovereign and the rupee, as well as between the dollar and the rupee, shows no signs of being fixed for a long time to come. They will vary, and the variation will depend upon the sterling exchange on New York and the price of silver. SRNIVAS R. WAGEL.

New York, Feb. 6, 1920.

Bang! And Another Redskin Bit the Dust

In your issue of Feb. 7, an editorial expresses surprise that anyone should have the impression that the *Engineering and Mining Journal* is "allied with Wall Street and the Trusts." If you will permit me to say so, your nerve in expressing such surprise is quite in the Wall Street manner. There has scarcely been an editorial page in the *Engineering and Mining Journal* for years that has not preached the very essence of Wall Street philosophy. Editorials in the *Engineering and Mining Journal* and in the *Wall Street Journal* could be transposed without the readers of either noticing the difference. Mr. R. B. Brinsmade made a full analysis of the Walkerian economics of Mr. Ingalls (whose fourteen-year editorship of the *Engineering and Mining Journal* is one of its bright spots, as a recent issue said) in the *Mining and Scientific Press* of Nov. 1, 1919.

In addition to the very obvious bias of the *Engineering and Mining Journal's* editorial pages, any engineer who has paid a visit to the office of the *Engineering and Mining Journal* can scarcely help noticing the Wall Street atmosphere of the place. I remember several such visits (each, I believe, at the invitation of some member of the publication's staff), and not even the Harvard Club or the copper country office of the Calumet & Hecla can condescend more stiffly toward a guest. If Wall Street means a certain reactionary and capitalistic aloofness, I think the *Engineering and Mining Journal* typifies it very thoroughly. Your coolness in denying it is typical of the amazing obtuseness of the Wall Street point of view. P. B. MCDONALD.

New York University, Feb. 9, 1920.

Latin and Greek

Mr. Finlay's letter in the *Engineering and Mining Journal* of July 26 relates to a question of great practical importance for parents who have children to be educated as engineers, and who must decide whether it is worth while to devote considerable time to the acquiring of a smattering of Latin or Greek—for it is pretty certain that not one student in a hundred ever attains a useful command of either language.

A familiarity with the question for many years has convinced me that for an engineer-student to attempt anything like a thorough knowledge of either of these languages would be an error. On the other hand, a knowledge of the thoughts that were written in Latin and Greek may be of great value, but this knowledge can be acquired through the English language in a hundredth part of the time it would require to read the originals.

Latin is held to be of especial value in throwing light on the origin of many of our words. But this knowledge can be better gained through a direct study of etymology, which should include the origin of words coming through Anglo-Saxon and other root languages.

Though a knowledge of the history and literature of Greece and Rome should be a part of the education of every engineer, yet considering that both of these peoples were slaveholders, that their chief activity was treacherous warfare, their literature saturated with obscenities, there is some doubt as to the value of this knowledge to a youth who aspires to a pure and upright manhood. As far as Greek is concerned, it seems as if it might be well to start with modern Greek, which can be conversationally employed with the waiters, bootblacks, and fruit sellers in most of our cities. From this knowledge ancient Greek would have a more vivid interest. I fail to see how the knowledge of any language can have a special cultural influence; it is not likely that the boys of nine or ten in Rome or Athens, although they spoke Latin and Greek fluently, had any cultural advantage over American boys of the same age.

The superiority of the classically educated is accounted for by Matthew Arnold[1] as follows: "The study of letters is the study of the operation of human force, of human freedom and activity; the study of nature is the study of the operation of non-human forces, of human limitation and passivity. The contemplation of human force and activity tends naturally to heighten our own force and activity; the contemplation of human limits and passivity tends rather to check it. Therefore the men who have had the humanistic training have played, and yet play, so prominent a part in human affairs, in spite of their prodigious ignorance of the universe, because their training has powerfully fomented the human force in them."

But many learned men feel that there is an odor of sanctity attaching to the study of Greek. President Hadley of Yale, in his report for 1909, deems it a great misfortune that the sutdy of Greek is dying out. He writes that Greek and Latin "have a peculiar claim to consideration as a discipline, wholly aside from the question of literary quality and historic value." He further states[2]: "The ideal college education seems to me to be one where a student learns things that he is not going to use in after life by methods that he is going to use. The former element gives the breadth, the latter element gives the training."

The word "use" may possibly be employed by President Hadley in a sense that restricts it to bread-winning "use"; but as the statement stands it does not seem to prove that classical study is an ideal education for an engineer. One fact is certain: the tendency of the times is for the study of Greek (and in a less degree of Latin) to become a volunteer subject; it is rapidly ceasing to be compulsory, even as did Hebrew many years ago. Educational methods are now being revised in most countries, and in Britain and Germany there is every evidence that compulsory Greek will be dropped.

Another argument in favor of the study of Latin and Greek, and modern languages as well, is that a knowledge of them enables a man to write better English; although, judging by the result of my own study of a number of languages, this argument is fallacious. If you wish to write better English you must study English itself—a sufficiently difficult subject for anybody. On this subject the following quotation is instructive[3]: "We have no reason to believe that the study of modern languages is an agency of mental discipline more than any other study properly followed. I think there is almost no evidence that a given amount of time spent in the study of a modern language reinforces ability either to comprehend or to express English, in anything like the degree to which an equal or less amount of time given to the proper study of English would contribute."

To offset President Hadley's opinion, given above, here is the statement of a great chemist, Sir William Ramsay, who said that he had spent the years from the age of seven to sixteen largely in studying the classics and felt that the true object of education "the power of concentration, the exercise of judgment, and, most of all the development of the inventive faculties, could have been attained infinitely better by substitution of almost any other subject for the classics."

Matthew Arnold, the high priest of liberal culture, said that a Latin grammar of thirty pages would amply suffice as a universal preparatory discipline; he refutes the statement that it is only by close philological study of Latin and Greek that the science and literature of the ancient world can be reached, saying that the proposition is untrue, and prophesies that the intensive study of Latin and Greek will be confined to pupils with special aptitude.

A curious criticism has been made in a college publication, that technical schools are a failure because they turn out subordinates and not managers. I feel certain that there is no lack of managerial ability among technical graduates and that their failure to become managers (if such failure exists) is due to other causes than the education they receive in the technical schools.

This sweeping condemnation is offset by the work of Professor Terman, of Stanford, a specialist on estimating intelligence, who has tested about 1,700,000 of our soldiers. He found that the engineers stood ahead of all others in intelligence and that the record for an individual was attained by an engineer officer. That the engineer does not have the standing with our Government which he does in Britain is well known, and this is a wrong for which some remedy should be found.

Thinking over these matters leads me to ask: What ought education to do for a man? I hold that it should first teach him to care for himself so that he may have a sound mind in a sound body; next, he must know how to win wealth enough to care for his family. After that his mind should be trained to give just decisions on public questions. If man were a reasoning animal these ends might be reached, but as he is a creature largely governed by passion, prejudice, and interest, there is no hope that even the most learned men will be governed by abstract justice. Let him who doubts this consider recent history, such as the manifesto of the ninety-odd German professors, or the Shantung mess before the Senate. To an ideally educated man no form of human activity would be unsympathetic, and his conduct would harmonize with the rule enunciated by Confucius 2,400 years ago: Do nothing to others that you would not wish to have done to yourself.

W. H. SHOCKLEY

Palo Alto, Cal.

[1] "What Is Education?" By E. C. Moore, p. 156.

[2] "Psychology of High-School Subjects." By C. H. Judd, pp. 401-2.

[3] "Problems of Secondary Education." By David Snedden, p. 155.

By The Way

M. C. M. Votes for Hoover

At a meeting of the student body of the Michigan College of Mines, Herbert Hoover was unanimously indorsed and urged to run for the Presidency of the United States of America, regardless of party. At present the college assays 85 per cent ex-service men of voting age.

Metropolitan Notes

If Representative Vestal's bill providing for the coining of a two-and-one-half-cent piece goes through, the New York public will find it much more convenient to pay two and a half cents for a newspaper than two cents as at present.

A deposit of asphaltum has recently been uncovered on Manhattan Island in the vicinity of Broad and Wall Streets. At the point of discovery it is overlaid by five or six feet of sand and gravel and rests conformably on a conglomerate bed. Study of the origin of this interesting occurrence will doubtless prove enlightening. A local source of pitch will be handy for the next political campaign.

The wielder of the pick and shovel holds the key to the situation in New York. Not for decades have the main highways and crossings been in the present condition following the recent storm—all for the lack of shovelers. Drivers of motor trucks who saw service in France are probably often reminded of the shell-torn roads as they attempt to navigate the humps and hollows of 34th Street where ice, snow, mud and water form at times an almost impassable mixture.

And drift mining has become popular. The small boy has had his fill of trenching and tunneling, drifting and crosscutting, with what fancies one can only imagine. But mining is not new for New York. It would take many of the largest mines put together to equal the excavation and development work that has been done underground and on the surface in recent years. Then, too, many of our wildcats conduct their mining operations within the city limits, although the necessary funds may come from without.

Personals

T. D. Wilson, manager, and Mr. Hutton, chief engineer of the Ray Hercules Copper Co., of Arizona, recently made a trip through a part of the company's plant at Ray under rather unusual circumstances. Both were standing on the ore in the concrete railroad bins when the men below started to draw off a carload. Hutton was drawn down in the center, but Wilson managed to keep near the side of the bin. Hutton's feet went through the chute and he was jerked free by an astonished Mexican loader. The chute was allowed to run and soon Wilson made his appearance. Both were uninjured, though somewhat bruised.

Shimmying in Overalls

A novel ball was held recently at Metcalf, Ariz., where some of the Arizona Copper Co.'s mines are situated. The invitations were mine orders, blueprinted, and the programs time cards. The hall was transformed to represent a stope. The refreshments were served from miner's dinner pails and baskets and the grand march took place in the light of miner's lamps. The men wore overalls.

Clemenceau

United Verde Extension's smelter town, known as Verde, Ariz., is hereafter to be called "Clemenceau," by the Post Office Department, at least. It was decided that "Verde" was confusing, as there was an old postoffice in the same valley by the name of Fort Verde. James S. Douglas, president of the Extension, is said to have selected the new name, having in mind his overseas experience in the Red Cross at the Paris depot.

A Mere Trifle

A recent newspaper report stated boldly in the headline that a two-pound gold nugget had been found in the Congo, and in the body of the item this two-pound nugget had grown to a twelve-pound one. About as accurate as most newspaper reports on such bits of news, one will say. But if one stops to consider that at the present time a miner must pay five dollars for a flannel shirt that he used to buy for a dollar and a quarter, twelve or fifteen dollars for a five-dollar Stetson, and almost any sum for a cheap (quality) pair of boots, a little inaccuracy of 10 lb. of gold should not be censured too severely.

Tapping the Mint

A skilled worker in the Denver mint was recently arrested charged with stealing gold bullion valued at more than $100,000. According to secret service officials, the bars had been carried out from the mint concealed in the hollow of a false leg which the thief wore. The thefts began the latter part of January, so at least $3,000 worth of gold must have been removed per day. When arrested the man had $1,400 hidden in the leg.

Memories

A bed of glauconite thirty feet thick was recently discovered at Gingin, Western Australia. Thus we introduce to our readers, if they do not already know of it, a locality worthy to rank with Rye, N. Y., Whiskeytown, Cal., and Brandywine, Pa., as far as nomenclature is concerned.

A Plea for a Standard Man

The following letter was received by the U. S. Geological Survey in reply to a request for 1919 placer production:

Dear Sirs,

The last years work was sent to you something in the form, that this years work will be—Two wit—
Done quite a bit of ground sluceing But did not get out any gold, But gold in sight—So—Frog eyed Brother clamed the ground. I clame nothing but man-hood at any time. Don work thrue force of habbet.

Sold some wheare near 2 oz. and was beat out of ½ oz. or a littel more ¼ oz was figured out of a little over ½ oz was taken thrue crucked gold scals. I told buyer if he lost any thing at the bank or mint that I would make it good so expect to have any whear from $1.50 to $3.50 to give the man yet. Would reather it would be this way than to have trubbel, or to have a puzzel headed thing squealing wisdom justice and honer at me, I would say to form some kind of standerd man and wipe out this cussedness with intelagence and not with a masacree as it still seems to be doing.

Hoping your trubbles are as light as mine and we both see things alike

Yours with a free hand
(Signed) ————
Richardson, Alaska.

South American Photos From the Field

CHILEAN "BOLSA," DOUBLE-BODIED RAFT MADE OF SEA-LION SKINS AND INFLATED WITH AIR. USED IN LANDING ON PARTS OF THE WEST COAST OF SOUTH AMERICA WHERE NEITHER BEACH NOR PIER IS AVAILABLE

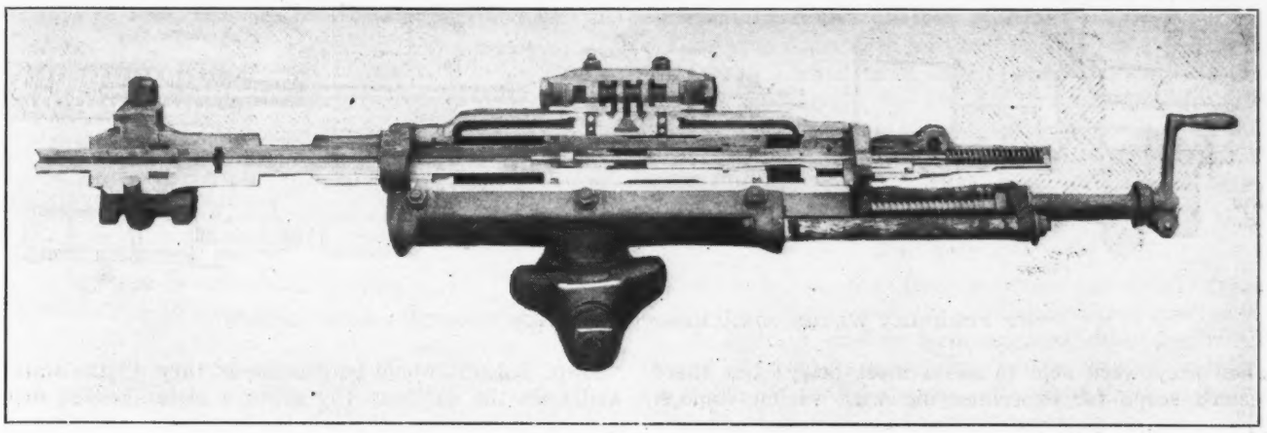
THE CHILEAN "BOLSA" IS SO LIGHT THAT ONE MAN CAN LIFT IT. HERE SHOWN TAKEN ABOARD A ROWBOAT

Piston Drills for Use With Hollow Steel

The Advantage of Delivering Water to the Bottom of the Hole While Drilling—Two New Types in Use on the Witwatersrand Ferreira Deep—High Cost of Phthisis Prevention

BY E. M. WESTON
Written exclusively for the *Engineering and Mining Journal*

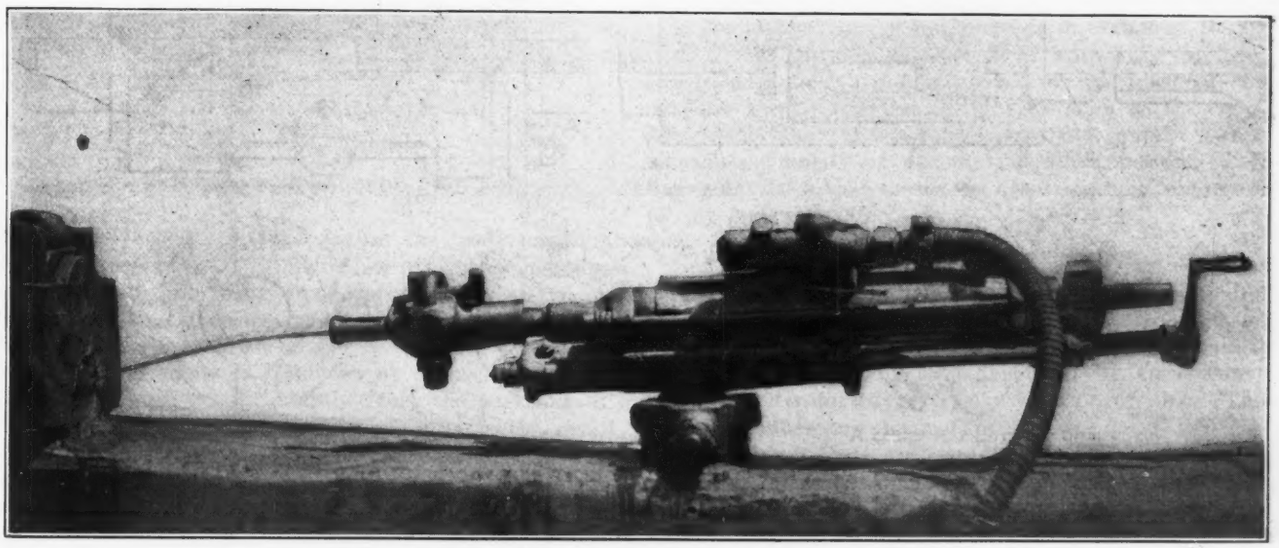
PAUL SELBY, manager of the Ferreira Deep mine, and three associates have invented a new type of water-feed piston drill. The construction of this drill is well shown in the accompanying illustration. There have been numerous attempts to perfect such a type of drill, but no one has succeeded in entirely preventing leakage of water into the drill itself or in completely stopping leakage at the chuck.



SECTION OF FERREIRA WATER-FEED PISTON DRILL

The novelty of this design consists chiefly in making the water tube rigidly connected with the piston in such a way that no sliding joint is required and the water tube reciprocates with the piston. This allows the sliding joint to be taken outside the machine and housed in a rear extension. This joint, which is a simple one of leather packing, has two weeping plates, which at once show if any leakage of air is taking place from the machine or any water leakage from the rear extension where the water enters.

The other novelty is in the design of the chuck. A taper chuck was first tried; but it was found that the steel had a tendency to stick at critical times, causing delay. The chuck shown in the drawing was then designed. The tightening of the U-bolt presses the pad against the rubber ring, making a perfectly tight joint. These rubber rings last three weeks. The alterations to standard 2¾-in. or 3¼-in. piston drill, including an extension of the feed screw handle, new back plate and attachment, chuck and the boring out of piston, cost locally about $12. A large number of these drills are now running underground in the Ferreira Deep and other mines, and they certainly appear to have solved the dust problem. Except in very hard ground, they drill "upper"



PISTON DRILL WITH WATER-FEED IN OPERATION

holes more rapidly than machines with solid steel. No great increase in drilling "down" holes is noted. Maintenance costs are not excessive, and in the softer-drilling flat stopes of the Far East Rand these machines should show most excellent results.

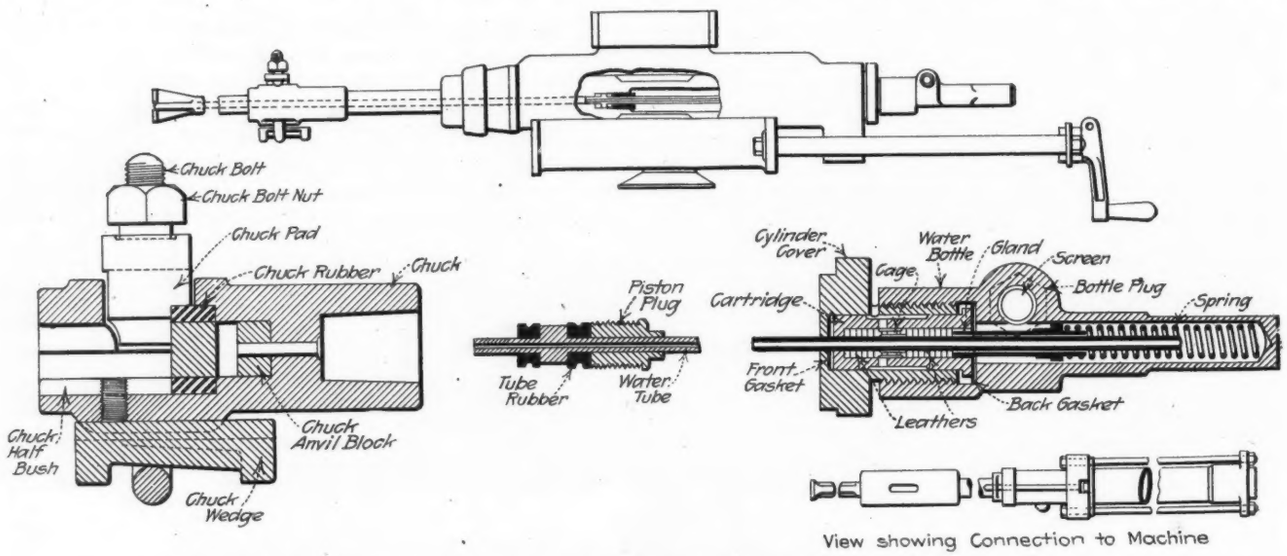
In all local-made Australian rock drills, taper chucks, even for large 3¼ machines, have been exclusively used. My own experience, when working with taper chucks many years ago, was that they were liable to stick just when they were able to cause most delay; but there seemed scope for experimenting with various tapers. They certainly hold the drill in a more central and true position and allow faster drilling, compared with the U-bolt chuck in average state of repair.

Mr. Swift, an Australian miner, brought over the design shown in the accompanying drawing, and has a number of 2¾-in. drills running successfully at the Van Ryn Deep mine. There is nothing very novel in the design, but the packing is well designed, and a weeping plate prevents water working back into the air cylinder.

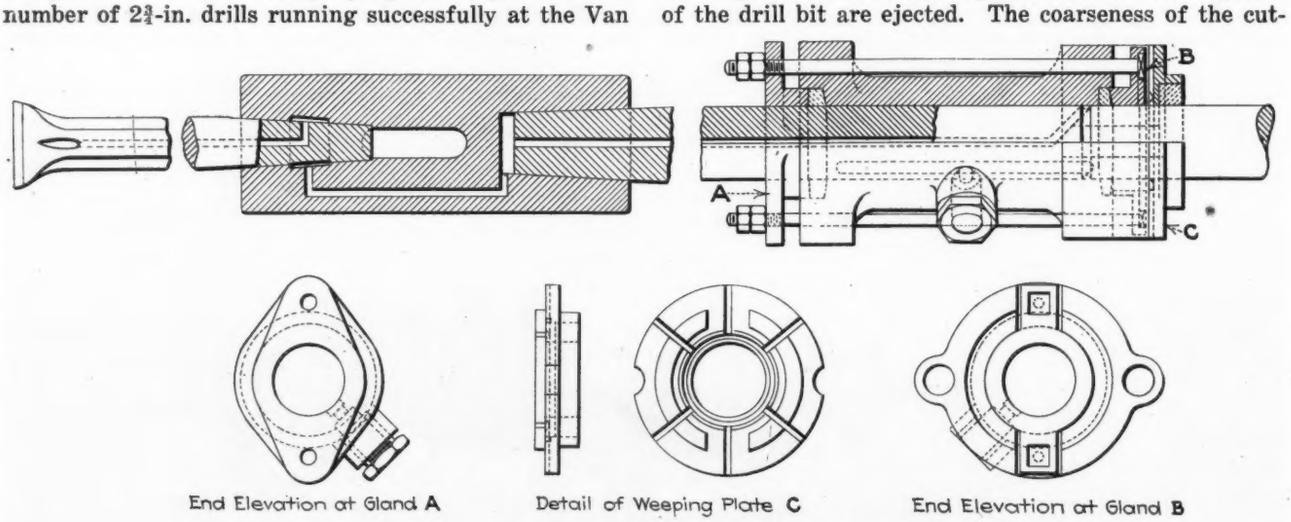
What is required to make such machines complete with jackhammers is the development of a faster drilling speed. I have always been and still am of the opinion that the way to do this, if the ground is not excessively hard, is first to shorten the stroke, and if necessary provide valves at both ends of the cylinder to run the number of strokes per minute up to 1,000, with, say, a 3-in. stroke. The experiments with the torpedo drill showed this could be done with a large increase in drill speed. Second, a larger central hole is required, and the turning the drill bit into a core drill, again on the lines of well-known experiments. The chucks of the machines mentioned could be modified so that in drilling "down" holes it would be possible to turn off the water and eject the cuttings (by using a piston-headed drill bit) up the steel and through the chuck.

Anyone having seen a piston drill drilling with a 1¼-in. round steel with a ½-in. hole in the center on this system will not forget the violence and rapidity with which pieces of rock ⅜-in. square or even broken pieces of the drill bit are ejected. The coarseness of the cutting and the speed of drilling are a revelation. Signs are not wanting that the water-feed piston drills will find increasing popularity on the Rand.

The government is passing a bill making the compensation for miners phthisis a most serious matter for the mines. Next year, for instance, it will cost them over £1,000,000.



THE FERREIRA WATER ATTACHMENT FOR RECIPROCATING ROCK DRILLS



SWIFT'S WATER FEED ATTACHMENT FOR ROCK DRILLS

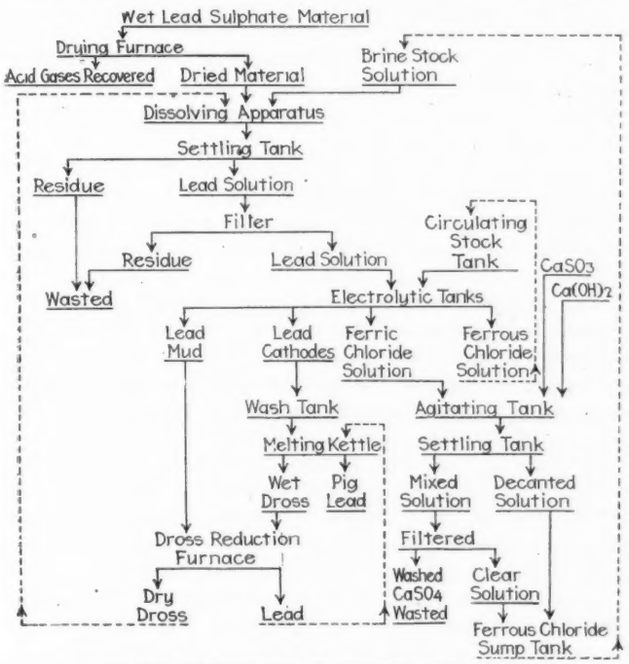
The Problem of Reducing Lead Sulphate

The Compound Causes Much Trouble for Lead Smelters, Occurring in Dust and Fume—Present Methods of Treatment and a Proposed New Process of Recovering the Lead by Electrolytic Means

BY F. N. FLYNN
Written exclusively for the *Engineering and Mining Journal*

IN THE metallurgy of lead, both wet and dry, no compound of lead is more frequently encountered than the sulphate, and no other form of this metal is more difficult to reduce; but that it should be reduced is most important; in fact its reduction may be said to be the key to the successful treatment of complex lead-zinc-sulphide ores. Lead sulphate is found naturally as the mineral anglesite, and contains, when pure, 68.3 per cent of lead, 10.6 per cent of sulphur, and 21.1 of oxygen.

Artificially, a small amount is produced in the manufacture of sulphuric acid by the chamber process, by



FLOW SHEET OF PROPOSED PROCESS

the corrosive action of the gas on the lead chambers. A plant operating on brimstone will produce less lead sulphate than one using ore roasting furnaces, which, in turn, will produce less than one operating on blast-furnace gas. From 0.6 to 6.0 lb. per ton of 50-deg. chamber acid made is produced at such plants. The minimum figure results mainly from the corrosion of the lead chambers. The maximum figure is the result of using pyrite containing lead, a part of which is volatilized as lead oxide and is caught in the chambers.

A much larger amount is contained in the dust and fume from the various operations of roasting, sintering, smelting, and converting of lead ores. Modern plants are designed so that the dividing line between dust and fume is quite distinct, in order to facilitate the recovery of the two byproducts with the least contamination. The coarser ore dust settles in dust chambers of large cross-section, giving a gas velocity of about 4 ft. per sec., and is then either briquetted or sintered and returned to the blast furnace. The very lightest dust and the lead fume are caught in a bag filter or a Cottrell precipitating plant, but they are not always re-treated by the same process which caused their production. When the fume is sufficiently free from dust, it is sometimes further purified and sold to paint makers, but the extent of this use is not sufficient to absorb all that is made.

Lead-zinc fume with varying amounts of ore dust is sometimes leached with sulphuric acid. The solution is then electrolyzed for the production of electrolytic zinc, and the residue of lead sulphate smelted in the blast furnace. The quantity so treated is constantly increasing.

BRIQUETTED AND CHARGED TO A BLAST FURNACE AT ONE SMELTER

The bulk of the lead sulphate produced from sulphuric-acid plants in the United States is purchased by an Eastern custom lead smelter. The treatment charge is based on a wet ton, and it usually contains about 20 per cent moisture, with some free sulphuric acid. If much acid is present, sawdust or lime is added to facilitate handling. It is then briquetted with an equal weight of dirty litharge lead dross or other lead-bearing material, and the dried briquets are smelted in a lead blast furnace. They are mixed with Parkes process antimonial slag for the production of antimonial lead, or with silver-bearing material for the production of silver-lead bullion.

If the quantity of lead sulphate is in excess of 10 per cent of the furnace charge, it is impossible to keep the furnace in continuous operation, and with 10 per cent on the charge the furnace tonnage is less than half of normal. If the charge does not contain a considerable quantity of uncombined silica, barren silica flux must be added to secure a satisfactory reduction of the lead sulphate.

SOME LEAD SULPHATE SOLD TO PAINT MAKERS

At another custom smelter, complex zinc-sulphide ores containing lead, gold, and silver are purchased, as are also clean zinc ores. The complex ores are roasted for the production of sulphuric acid by the contact process, and retorted for the production of zinc. The retort residues are burned in a blowing-up furnace. The lead-zinc fume recovered from the baghouse is sold to paint makers. The resulting sinter is smelted in a blast furnace for the production of silver-lead bullion. The blast furnace lead-zinc fume recovered from the baghouse unit connected to the blast furnace is returned to the furnace until its zinc is lost in the slag.

At one time, a portion of the lead-zinc fume from this plant was shipped elsewhere for treatment. This consisted of dissolving the zinc in sulphuric acid for

the production of electrolytic zinc and selling the lead sulphate to a custom lead smelter.

At one of the custom ore-smelting plants in the West, complex lead-zinc sulphide ores carrying up to 20 per cent zinc with lead, copper, gold, and silver are treated as follows: Ore crushed to ¼ in. is mixed with 1-in. lime rock and roasted to 9 per cent sulphur. The cooled calcine, mixed with 20 per cent anthracite, is charged through the roof and along the side walls of a reverberatory furnace. Powdered coal keeps the temperature of the gases at the furnace outlet at about 1,230 deg. C. The matte fall is 12 to 15 per cent, assaying about 4.3 per cent lead, 4.8 per cent zinc, and 4.6 per cent copper. The slag will average 0.3 oz. of silver, 0.1 to 0.2 per cent of copper, a trace of lead, and 5 to 6 per cent of zinc.

The furnace gas is cooled, and filtered in a baghouse. The lead-zinc fume is reheated to shrink it about one-fifth, so that it weighs about 60 lb. per bushel. It is then shipped in bags to another plant for treatment, which consists of the usual electrolyzing of the sulphuric-acid solution for zinc, and the sale of the lead-sulphate residue to the custom lead smelter.

Stored on the Dump at a Canadian Plant

One of the largest deposits of complex lead-zinc sulphide ores in the world is in Canada. That portion of the ore which is treated contains 6 oz. of silver per ton, with lead, zinc, iron, and sulphur amounting to over 90 per cent. This ore has a natural crystallization of between 300 and 400 mesh. The part which is smelted is crushed to $\frac{3}{16}$ in., roasted in Wedge furnaces, and the calcine sintered in Dwight & Lloyd machines. The sinter is crushed, again sintered in Huntington-Heberlein pots, and smelted in lead blast furnaces for the production of silver-lead bullion. All of the 10 to 20 per cent of zinc is lost. The portion which is leached is crushed to 200 mesh, roasted, leached with sulphuric acid, the resulting solution electrolyzed for the production of zinc, and the tailing, containing a large portion of the zinc, all of the silver, and all of the lead in the form of lead sulphate, is stored on the dump for future treatment, as the attempt to smelt it proved to be unprofitable.

Consideration has been given to the suggestion to smelt all of the ores and the zinc tailing on the dump, in a reverberatory furnace, fuming all the lead and zinc, and leaching the fume with sulphuric acid for the production of electrolytic zinc and lead sulphate. This would increase the zinc extraction materially, but would result in the production of a byproduct of more than one hundred tons of lead per day, in the form of a residue of almost pure lead sulphate. This suggested method of treatment was considered unsuitable, because a method could not be found for the economical reduction of the lead-sulphate precipitate.

Research Work of Bureau of Mines

In an endeavor to find a cheaper way of treating low-grade lead ores, a considerable amount of research work was done at the Salt Lake Station by the Bureau of Mines. The results of these investigations are published in Bulletin No. 157, entitled "Innovations in the Metallurgy of Lead," 1918, and although most of the tests were made on oxidized ores, some sulphide ores were roasted and certain tailings treated which contained appreciable amounts of lead sulphate. The ease with which lead salts, including lead sulphate, are dissolved by a saturated solution of sodium chloride is clearly shown. Many precipitants were used to remove the lead from solution, but in each case it was necessary to melt the resulting precipitate. The most promising tests made were by electrolytic precipitation to metallic lead. Cast-iron anodes were used. This required the solution of at least 56 lb. of iron for each 207 lb. of lead precipitated, which, with the loss of the iron, made the scheme of little commercial value.

Wet Methods Offer Most Promise

After smelting many thousands of tons of lead-sulphate precipitate in the many years which I have spent in the lead-smelting business, I am of the opinion that no satisfactory method will be found for the reduction of lead-sulphate precipitate in the dry way. Realizing the importance of finding a better and cheaper method, I have carried on research work which has led into very promising electro-chemical methods. A suitable wet method could compete with lead smelting in a district where that was carried on, and would have many advantages in certain isolated mining and milling districts where smelting could not be considered. The following process seems to me a considerable improvement on the present practice:

The lead sulphate is dissolved in a suitable solvent, such as a nearly saturated brine or solution of sodium, calcium, or magnesium chloride containing a quantity of an easily oxidizable salt, such as ferrous chloride, in amount and for the purpose described later. The solution of lead thus obtained is then electrolyzed, using a lead or iron cathode and an insoluble anode of graphite, carbon, magnetite, duriron, or other suitable substance.

The oxidized salt, or ferric iron, resulting from the depolarizing action of the ferrous chloride during the electrolysis may be reduced to the ferrous condition by means of sulphur dioxide or other reducing agents. A portion of the sulphate radical is precipitated and removed from the solution resulting from electrolysis, by adding a substance capable of forming an insoluble sulphate, enough being added to prevent the accumulation of the sulphate radical. The solution thus treated is readily usable for dissolving fresh quantities of lead sulphate, and a cycle is thus established.

This process might be carried out as follows: Lead sulphate, or the material containing lead sulphate, is charged into a suitable apparatus and brought into contact with the brine solution long enough to dissolve it. The resulting solution is then removed or decanted from any insoluble residue. It contains approximately 1 per cent of lead in the regular course of operation, and is then ready for electrolysis. In starting operations, a quantity of ferrous chloride is added to this solution, to act as a depolarizing agent in the subsequent electrolytic step, and to prevent disintegration of the anode. The amount of iron present in solution as ferrous chloride must be in excess of the chemical equivalent of lead precipitated during any cycle. Electrolysis is carried out in the usual way, utilizing an anode of graphite or other suitable material.

The chlorine evolved at the anode immediately unites with the ferrous chloride, forming ferric chloride, so that no free chlorine is liberated. It is usually advantageous to precipitate by electrolysis at this stage as much of the lead as possible, so that the resulting solution may contain as little as 0.01 per cent of lead.

The solution, as it leaves the electrolytic tanks, is

carried into an apparatus to reduce the ferric iron to ferrous iron and to precipitate the amount of sulphate radical requiring removal. The ferric chloride formed in each cycle must be again reduced to the ferrous condition for two reasons: First, any considerable amount of ferric chloride has a disadvantageous effect in seriously reducing the cathodic deposition efficiency, and, second, as large a proportion of the total iron as possible should be present in the ferrous condition, in order to make use of its depolarizing action.

Sulphur dioxide, or sulphur dioxide combined with lime as calcium sulphite, may be used to reduce the ferric iron to the ferrous condition. If sulphur dioxide be used, the operation may take place in a tower like that in use for similar purposes. If calcium sulphite be used, it is prepared and added to the solution in an agitating apparatus. It may be advisable to reduce the ferric iron in other ways, depending on local conditions and material available for treatment. For example, instead of using sulphur dioxide produced in the usual dry way, it may be found more convenient to bring the solution containing the ferric chloride in contact with a sulphide ore capable of being acted on and dissolved by the ferric chloride. This may also serve to extract one or more of the valuable constituents of the ore.

The free or combined sulphuric acid which accumulates must be precipitated by agitation with lime or otherwise, to preserve the solvent action of the brine liquors on lead sulphate. The resulting precipitate may be removed by settling and drawing off the solution. The solution thus prepared is ready for the repetition of the cycle, and may be pumped back to the lead-sulphate dissolving apparatus.

The lead will be precipitated as cathodes, nodules, and as a powder. The cathodes would be washed, melted in a kettle, and cast into pigs. The nodules would be washed, and melted in a dross reduction furnace. The powdered lead would be filtered and washed free from all solution salts, and the further treatment would depend upon the purpose to which the lead is to be put. If smelted for pig lead, the filter cake could be charged wet into the dross reduction furnace. If for use in certain manufactured products, for which it would be very acceptable, it might be advisable to wash it, before removal from the filter, with a weak acid solution. The drying would tend to oxidize it.

The Future Prospector

Old-Time Type Should Be Supplemented by Technically Trained and Experienced Men To Conduct Further Investigation of Known Areas

BY A. G. WOLF

Written exclusively for the *Engineering and Mining Journal*

IN RECENT months a great deal has been published in the technical press concerning the passing of the prospector and the consequent decrease in the number of new discoveries. Many ways have been suggested for righting this situation; but is it true that the prospector is passing, and are there fewer prospects now being worked or discoveries being made than was the case a few years ago?

In the first place, I do not believe prospectors are becoming fewer. Without doubt the old-time prospector is decreasing in numbers—the one who, in the spring, loaded all his earthly belongings, including a sack of beans and some slabs of bacon, on a burro, or on two burros if he was opulent, and headed for "parts unknown."

Then, too, there is less "grubstaking," because of there being less likelihood of good discoveries being made than formerly. However, these are not the only prospectors. I think I am correct in saying that in nearly every mine in the Western states, employing over fifty men and situated in a section where outside work in winter is not practicable, at least one of the miners is a prospector who works during the winter and early spring months only to grubstake himself for his summer and fall campaign of prospecting or of development work on a prospect already discovered.

Now as to the second question, are fewer discoveries being made? Yes, undoubtedly; and the number is decreasing yearly. But what has already been said about prospectors indicates that thousands of discoveries have already been made, the true value of which has not been disclosed.

Various proposals have been made with the idea of improving the quality and increasing the number of prospectors. All of them are open to objections; but, nevertheless, something new must be tried to produce new results. From a humanitarian standpoint, the plan of Federal aid, suggested recently through the *Engineering and Mining Journal*, has one excellent point, that of offering remunerative and healthful work to invalided soldiers who require such an outdoor life to effect a recovery. Manifestly, however, it will not aid in the solution of this problem, for even after giving the men the rudiments of mineralogy, geology, and other subjects, they would be of little or no practical value in finding mines.

The employment of able-bodied men by the Government on a salary basis, as was also suggested, I believe would only be an incentive for certain individuals, temperamentally disinclined to work, to seek "soft" jobs.

Selection of properly experienced technical men, rather than the educational training of the present type of prospector, appears to me to be the quickest and best way of improving the efficiency of the whole class of prospectors. The kind of man now needed for prospecting work is one who has had education as a mining engineer, and has had at least ten years' practical experience, a large part of this time as field engineer, examining engineer, and mine superintendent.

Little prospecting has been done by men of this caliber, so many discoveries should be made of mineral which the old-time prospector overlooked. True, the quality of imagination,—that makes a man dig on faith alone, so pronounced in the old-timer, will be largely lacking in these technical prospectors. A large part of the country, however, has been explored by the old-timers and will be again, as there are still many representatives in the field. Technically trained prospectors will serve two purposes: they will scour the country all over again, applying greater knowledge to the work than has ever been employed before, and will also examine prospects already discovered and worked.

I feel confident that the employment of field engineers and capital as described will result in the gleaning of many good mines from discoveries already made but lying dormant because of lack of capital or proper direction in its use; and that many absolutely new discoveries will be made.

Important Factors in Red-Brick Manufacture

Common Building Brick Cannot Be Made From Any Kind of Clay—Chemical, Mineralogical, And Mechanical Tests, Supplemented by Geological Exploration, Must Be Carried Out To Avoid Costly Failures

BY ROBERT W. JONES
Written exclusively for the *Engineering and Mining Journal*

INDUSTRIAL mistakes and failures are an interesting study to the engineer; they may seriously affect a small group of people or may interfere to a great extent with the future industries of the region in which they are made. A district, particularly a mining district, may remain dormant for years as a result of failure properly to recognize conditions. In the non-metallic industries, such failures are usually not prominently brought to the attention of engineers. The romance and glamor of metal mining are more interesting, and this industry, as an object of scientific study, has far outgrown certain more prosaic non-metallic activities, such as the production of common brick from clay or shale.

COST OF RAW MATERIAL NOT EASILY DETERMINED

Few producers of common brick can state correctly the cost of their raw materials in terms of output. A large portion of the crude materials that go into the forming of common brick are returned at some point in the process for re-working. Another portion, and usually large, is finished and sold as "under grade." When the true cost figures of the raw material are calculated, it is usually found that they are out of proportion to the other costs of manufacture. The economical manufacture of brick usually depends upon the cheap production of the raw clay or shale, and the engineer who can succeed in this latter will soon find it advantageous to make the brick as well.

The first production of common building brick in the Eastern United States on a commercial scale was made about 1628. The growth of the building-brick industry in this country can be divided into three periods: from 1628 to 1835 all bricks were hand made; from 1835 to 1852 automatic brick machines were employed; and from 1852 to the present, wire-cut bricks have come to the fore.

The rate of progress, as shown in the improvement of manufacturing methods, has been slow, but the general knowledge concerning the crude materials necessary for the manufacture of building brick is little ahead of that obtaining during the first period of manufacture. To most producers of common brick, clay is simply clay, and they have no knowledge of the more or less complex mechanical mixture of the materials with which they are working.

Nearly all producers are acquainted with the ultimate chemical composition of the clay used, expressed as oxides of the various elements. They may also be acquainted with the rational analysis showing the percentage of clay-substance, quartz and feldspar. The statement has often been made that the commercial value of a clay depends only on the amounts of the four minerals, quartz, kaolinite, feldspar, and mica, which may be present. This may be true for a kaolin or other high-grade clay, but for the average producer of common brick to plan his future with such a principle in mind is to invite disaster. Kaolinite, we have been taught, is the basis of all clays, and it is usually included under the term of clay substance. Accepting these general statements as including all clays, and paying no attention to other substances, operators have constructed plants, oftentimes with the approval of engineers, which have resulted in nothing but failure.

IMPORTANCE OF ANALYSIS

The principal value of an ultimate chemical analysis of a clay is in the deteeting of unusual substances. The mineral analysis is of great importance. It should not be calculated from the ultimate analysis, but should be made from a combination of chemical, mechanical, and mineralogical (petrographical) analyses. Studied in this way, many surprising and interesting facts about both the chemical and physical composition of the clay may be learned. If the intention is to use a clay as a crude material it will always be advisable to have a thorough chemical and physical examination made, not on one sample but on many samples, and to have these examinations carried on in conjunction with a proper geological examination.

FIG. 1. REMAINS OF A $250,000 PLANT

As in metallurgy, the mill test is often a delusion, and the results are of little value unless carried out after the laboratory and field work has been completed. A proper geological examination of a clay deposit does more than simply take into account the geological history of the deposit such as we are familiar with in various geological reports. Borings are made, pits are sunk, tunnels are driven, and when the work is finished we have, in conjunction with a topographic map, a complete set of sections showing in detail the various beds, with a complete set of samples.

The following brief descriptions of typical failures may be of interest.

1. This property was placed in operation for the

manufacture of paving brick, with the intention of using a red-burning shale. The cost of this plant, including land, is estimated at $250,000. The plant was built on the strength of brief tests, and when production started it was found that the shale was not plastic enough to stand up properly in the column. To correct this defect it was necessary to add some soft plastic clay. The difference in temperature between the fusion point and proper vitrification point of this clay and shale mixture was so slight that though portions of the kiln would be properly burned, the underburned and overburned formed such a large percentage of the total that it was found impossible to continue operation. In this region, if anyone suggests the possible advantages of manufacturing a wire-cut brick from any shale or clay he is invited to look over the ruins (Fig. 1) of the modern kiln standing on this property as an example of the fate which awaits him. This failure was not due to improper equipment, but to a lack a knowledge concerning the geology and physical and chemical characteristics of the shales and clays.

2. A six-machine yard was opened, convenient to both water and rail transportation, for the manufacture of the ordinary soft-mud building brick. The total machine capacity was approximately 135,000 per day, and four markets were available, insuring continuous production. A burning-shed of 40 arches' capacity was constructed, with a total burning capacity of 1,400,000. A wharf and side track were also built. The clay was of the usual grade, or appeared so, and active production was started with the preparation of one kiln of 700,000 brick, for burning. The result after burning is shown in Fig. 2. Following the ordinary burning practice of the region, and using the "settle" of the brick as an indicator, the result was that the entire kiln was more or less fused into a solid mass. In addition, the clay was found to carry lime pebbles, causing the brick to swell and burst. This, the only kiln of brick burned on the property, still stands as it was left about fifteen years ago. The investment is a total loss.

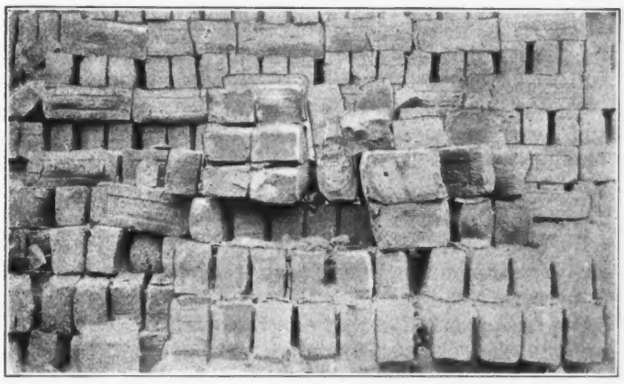


FIG. 2. APPEARANCE OF BRICK IN PLANT 2 AFTER BURNING

3. In this case there was also a loss due to ignorance of the chemical composition. The clay was a remarkable red-burning material compared with the usual clays of the region. On the strength of the color, it was decided to make what is known as a dry-press brick, using just enough moisture to hold the clay grains together, and forming under great pressure. This method gives a remarkably true-formed product. The material worked well and was passed through the plant without screening. The temperature of burning did not need to be carried very high, and the industry had all the indications of an assured success. However, after standing in the stock piles for a short time, the bricks began to scale badly, so that they were unfit for use, as intended, as face brick. Fig. 3 shows what happened to the stock piles in a few years. All that remains is a mass of crumbly burned clay, with the general form of brick. Another total loss. The trouble here was due to crystals of gypsum which were found throughout the entire deposit. Some were four inches long, and they were so abundant that they could be noticed at a distance of fifty feet from the face of the clay.

FIG. 3. CRUMBLING OF BRICK MADE BY PLANT 3 DUE TO GYPSUM CRYSTALS

Tunneling the English Channel, which is now certain of accomplishment, will be the world's greatest engineering feat with the possible exception of the Panama Canal. This tunnel, which will link France and England, will be 30 miles long. More than 21½ miles must be constructed under the sea. The plans call for two tunnels, each of 18 feet diameter, with connecting cross galleries every 200 yards. The greatest depth of water to be encountered will be 180 feet. To make the tunnel thoroughly safe, it will be 100 feet below this level, or 280 feet below the surface of the water. When completed, electrically driven trains will pass through the tunnel, and it is quite probable that trains made up in England will run throughout Europe without the necessity of the passengers having to change cars.

Fake Townsite Schemes

Oily Talk of Oil and Minerals To Separate the Unwary From Their Bank Accounts—How The Western Promoter Works the Distant Financial Fields—The Land Lottery

BY ALBERT G. WOLF
Written exclusively for the *Engineering and Mining Journal*

THE promoters of wildcat mines, the stock-selling agents for oil wells yet to be drilled in formations as barren of oil as the rhyolites of Nevada, the peddlers of shares in get-rich-quick schemes involving the use of some patented machine or process, have been exposed, legislated against, and held up to the scornful gaze of the previously unsuspecting public. The lightning-rod agent has long ago passed into oblivion. Every effort has been made by reputable publications to educate the people in the matter of fake "investments," and blue-sky laws have been passed to protect the public. But there is still permitted to roam at large one of the worst fakes that human ingenuity ever devised. It is all the more reprehensible, filthy, and utterly despicable because it aims to catch as victims those who can least afford to lose, and, conversely, those who know the least about investing their meager savings. I refer to the *fake townsite*. And the adjective fake is so generally applicable to townsite that the two words might well be hyphenated.

NEFARIOUS OPERATIONS OF THE TOWNSITE COMPANY

How far back the history of townsite companies extends is not recorded, and whether or not the number of these schemes is increasing I do not know; but one thing is certain: In the time in which this generation has the most interest, the present, this nasty ulcer of dishonest commercialism breaks out altogether too frequently. There are undoubtedly some honestly conducted townsite "deals," but the vast majority of them are fakes, for in practically every case the land is sold at a great increase over its real value, even after deducting the enormous cost of promotion. Surely, a scheme is a fake, to say the least, that obtains $1,000 per acre for land that is not worth $50, and obtains the money, too, by lying advertisements and agents.

In most instances a piece of low-priced or worthless land near some building industry, mineral strike, or proposed railroad extension is obtained. It is then divided into one thousand or five thousand "business" and "resident" lots. A beautiful prospectus is printed, showing the lot divisions, numbers, names of streets, park and band-stand reservations; also pictures of the nearby county seat, of the thriving industry (if there be such) a few miles off, but described as being within easy walking distance, or of some mineral discovery that is destined to bring in thousands of settlers to this locality.

"MINERAL UNDER YOUR LOT"

If mineral is the inducement, it is always printed in bold type, "there may be mineral under your lot—enough to make your posterity rich forever more." Then the smooth-tongued hustling agent is called in and promised 25 per cent of the gross receipts from sales if he sells all the lots. If there is no inducement of possible—nay, almost certain—mineral wealth under the townsite, then a grand lottery scheme must be devised to serve as bait for the human emulators of a certain well-known but despised fish. In this, some grand prize or several prizes are to be drawn for, each lot owner to have as many chances as he is fortunate enough to own lots. No chance to lose: the land is worth the money, the prize is simply something thrown in by the promoters out of the largeness of their hearts, say the prospectuses.

Then comes the selling. Does the agent start close to the townsite and try to sell to the nearby residents, working out in ever-widening circles? He does not. He buys a ticket that will carry him at least one thousand miles, and two thousand is better. If it is land with alleged mineral wealth, then farmers are the usual victims of this unscrupulous person; if farming land, why, then, no better place than Western mining communities to sell; and if oil, any city will do.

"TOWNSITE INVESTMENTS" USUALLY A COMPLETE LOSS

Do these townsite schemes ever bring the sudden wealth to the buyers of lots that is promised in the prospectuses? Not once in a thousand times. More often is the final result like that of Springdale, an old mining camp in Nye County, Nev., where a townsite was laid out and lots were sold. After the death of the boom, the town passed away too, and years after part of the same ground once sold for town lots was taken up as a homestead under the desert entry act.

One or two examples of townsite schemes will serve well to instruct the inexperienced and easily deceived investor. For the first example consider the townsite, say, of "Ashville," in a Western state with rapidly increasing agricultural resources. A minute village on a local branch of railroad was used as a nucleus. A townsite fourteen blocks square was laid out on land that at the most highly inflated value was not worth more than $200 an acre for agricultural purposes. Resident lots 50 x 140 ft. and business lots 25 x 140 ft. were sold for $150 each on time payments, with a small percentage off for cash. In other words, the buyers got fairly good farm land for not less than $900 per acre. To make this land worth its purchase price a town of 5,000 inhabitants would have had to spring up here. The promoters cleared, it can be estimated, somewhere between $50,000 and $100,000 on sales alone. But they had another chance to win if the town did grow, for the heart of the townsite was held out when the sale was made.

THE LYING PROSPECTUS AND AGENT AND THE LOTTERY

What made people buy? will be asked. In part, a beautiful prospectus and smooth-tongued agents, breezy and persuasive, but mainly the gambling feature connected with this deal. The whole thing was a lottery.

In addition to the lots, a hotel, several bungalows, a couple of forty-acre tracts, and other valuable properties were all thrown into a hat, figuratively speaking, and each purchaser drew as many times as he had paid in multiples of $150. To this day the original gamblers have never been informed who drew the hotel. Maybe it is still in the hat. But the people went into this with their eyes open, it will be argued. Quite true; but the Government does not permit roulette or faro; and why should it tolerate a gambling game where the chance to win is less than one in one hundred?

Territory "A Short Distance From the Well"

Another townsite in an oil-producing state will be sold by using entirely different inducements. A tract of land about one hundred acres in extent has been so divided that, in addition to the streets, there will be ten lots to the acre. These lots are for sale at the price of $100 per lot, or $1,000 an acre to the promoters for land not worth a tenth part of that. A prospectus, with several illustrations and maps, containing, to use a mild term, many exaggerations of the facts, has been printed, and agents are in the field looking for buyers. Some of these "exaggerations" are nearly, if not quite, sufficiently gross to get the agents into trouble with the postal department if any business is being done by mail. To quote from the prospectus: "We give you a lot . . . which is located not in a wildcat territory but in *proven territory* and *close to production* . . . a *short distance* from the —— well."

The italics are mine. The unvarnished truth is that the townsite most certainly is in wildcat territory by any construction of the meaning of that term. The statement that it is in "proven territory" is a deliberate lie. "Close to production" and "a short distance" from the —— well simmers down to a mile or more as the crow flies from this well, which is producing some oil, but in such meager quantity that one man with a tank wagon and a team of mules hauls off the production and peddles it to nearby drilling rigs, which, by the way, are not drilling for oil.

Actual Value of Land $1 an Acre

To quote further: "All of the land surrounding this well has been leased up by the big oil companies, and now deeper tests are under way to prove up the big stratas of oil." This is verbatim from the prospectus. It is a most barefaced falsehood. Nearly all of the land surrounding this well is held in fee by companies other than oil companies, and the little not so held is leased by the same interests. Big oil companies do hold considerable acreage under lease in this and the adjoining league (a land division), but at a considerable distance from the "producing" well. These leases, with the exception of those obtained by one promoter, have been held for years, and taxes are paid on an assessed valuation of about one dollar per acre for the leases. That does not indicate "proven territory." As to the "deeper tests," one company has drilled a deep wildcat well in this section, and abandoned it without producing oil. More exaggerations could be shown, but I believe sufficient has been set forth to indicate how truth is perverted to serve the ends of the promoter.

Comment on the absurd mistakes in grammar and English which abound in this prospectus are unnecessary, except to point out that they alone would make a discriminating reader dismiss the whole affair as the clumsy work of crude schemers. Unfortunately, the prospective victims are not always discriminating readers or listeners, and fall easy prey to misstatements in print and to the unctuous palavering of an oily-tongued salesman, especially if the land being sold is at a great distance. To illustrate this fact, and to show that the promoters themselves are cognizant that distance lends enchantment, one of the selling agents made the statement that if the promotors depended upon local sales the townsite deal would not be a success; but that after selling what they could close by they would take the whole business away off, to Illinois, for example, where the people would not consider the lots for home building, but would snatch at the oil prospects.

Promoters Usually Careful To Keep Within the Law

The above examples, though few in number, will serve to illustrate the manner in which the average townsite company operates. Many more instances could be given, but all are variations of the same theme. The general intention of a townsite company in an out-of-the-way place is to sell cheap land at a tremendous increase over its real value. Though the methods employed in selling are anything that will allure the public, they are generally so cleverly designed as to keep the promoters clear of the law. They consist usually of exaggerations and perversions of the truth regarding the value of the surface of the land, and of prospective underlying mineral wealth, although the mineral wealth is usually "proven" in the prospectus, not prospective or imaginative. Sometimes, as shown above, a gambling inducement, or lottery, is included, which is permitted on the grounds that everybody gets his money's worth of land, and a few investors get considerably more than their money's worth, whereas in reality almost everybody loses his entire outlay.

Let the blue-sky laws be extended to include the fake townsite scheme, one of the worst filchers, under false pretenses, of the little man's savings.

Bolshevik Oil

Many wildcat wells are to be drilled to explore the Red Beds of Texas for petroleum, according to a dispatch from Ranger. Oil has often quieted troubled waters, but it remains to be seen whether the product of the Red Beds, if any, cannot better be used in connection with agitating. This should not be overlooked by Minerals Separation, though, of course, nothing ever is.

Dry Humor

It has occurred to E. V. Lawler, of the Hardinge Conical Mill Co., that the decrepitation process may possibly be used to give employment to the ice machiner, bartenders and others who have been thrown out of work by prohibition. Mr. Lawler has in mind that a considerable amount of cracked ice was formerly used in the manufacture of high balls which is no longer required. Jesting of this painful sort is somewhat out of place—also we do not readily see the application of the ice machine to the decrepitation process. If Mr. Lawler will devise a nice little glass model of an ice machine to demonstrate its employment in decrepitation work, metallurgists in general will doubtless thank him for his effort.

Boulder County Fluorspar

Great Variation in Character of Deposits—Objections to Violet or Purple Color Purely Theoretical—Freight Differential Considered, Eastern Prices of Colorado Product Meet the Market

BY G. GILLINGHAM HIBBS
Written exclusively for the *Engineering and Mining Journal*

THE vicinity of Jamestown, situated practically in the center of Boulder County, Col., and about four miles within the front range of the Rockies, has been practically the sole source of the fluorspar movements in Boulder County. The deposits of fluorspar at Jamestown cover an area of about two and a half miles east and west and one and a half miles north and south.

Considering the limited area of fluorspar deposits there occurs a great variation in the general character of ore deposits, ranging from a highly crystalline light-colored spar, which in itself will run at about 90 per cent contained calcium fluoride and admixed with about equal quantities of galenite and pyrite, which latter is not disseminated throughout the deposit, but found in bunches at irregular intervals, through a series of massive and crystalline varieties containing little free quartz and carrying a small calcium carbonate binder running at about 76 to 82 per cent calcium fluoride, to a fine grain sandy fluorspar, the grains of which are bound together by an infiltrated hydrous silica containing also a little lime—these latter ores running from 50 to 80 per cent contained calcium fluoride. In the latter class, particularly near the surface, where, presumably, the greatest oscillation took place, there are encountered imbedded bodies of granite country rock in a highly metamorphosed state, ranging from mere specks to bodies a foot or more in diameter. With depth, however, on these latter bodies of fluorspar this foreign matter is less noticed, thereby raising the general calcium fluoride content of the run-of-mine ore.

CONSUMERS DEMANDING HIGH-GRADE PRODUCT

Under war conditions a number of the users of fluorspar accepted a plus-75 per cent grade, provided the silica did not exceed 14 per cent, but since the war ended, and business has been to a certain extent revived, 85 per cent is the lowest grade that is acceptable to buyers, which condition, with few exceptions, excludes the forwarding of crude fluorspar shipments from the Boulder County district.

Prior to the war, under individual private ownership, a number of properties in Jamestown were opened in an indifferent manner, apparently without intention of commercial development, under scientific mining methods, but solely for the purpose of gouging out ore, which ore was shipped to the Colorado Fuel & Iron Co. at Pueblo.

STEEL COMPANIES BEGAN USING CRUDE FLUORSPAR IN 1917

Early in 1917, at a time just before the United States entered the war, I introduced crude fluorspar to the large steel companies in the East, and shipments were duly forwarded. Unfortunately, the purchasers for large corporations, being accustomed to the Illinois and Kentucky spars, which carry a limestone binder, did not place in their contracts silica-restriction limits. This fact caused considerable confusion, as the metallurgical factor in relation to calcium fluoride and silica content is generally accepted by metallurgists at about 2½ to 1, clearly indicating that an ore running at 80 per cent calcium fluoride carrying 10 per cent silica requires a neutralization factor of 25 per cent of the contained calcium fluoride in any particular fluorspar shipment to neutralize the 10 per cent silica content, which, on the analysis above given, left a fluorspar efficiency of only 55 per cent calcium fluoride. This condition was naturally not acceptable to the metallurgists, and then a series of systematic jigging and table concentration tests was begun, and it was found that the ores of the Jamestown district would respond to a cleaning to an average of plus 85 per cent CaF_2 carrying not over 7 per cent silica, which silica content was acceptable to the eastern buyers, even though it was 2 per cent more than the silica limit written into Illinois spar contracts.

BOULDER COUNTY FLUORSPAR SUITABLE FOR OPENHEARTH WORK

Some difficulty was encountered by the necessary fineness of the product under the production of table concentration, and claims were made that the material "dusted" in the openhearth furnace work, causing loss in material used, but it was quickly found that the small percentage of moisture contained in the concentrates as delivered, permitted use in openhearth furnace work and that any addition of fluorspar reached the surface of the charge with little loss in dusting. The necessity of accurate fulfillment of contract specifications was immediately recognized, as this factor, much neglected by Western ore shippers in general, had been a deterring consideration in the advancement and production of the mineral resources of the entire Rocky Mountain district. That attention was paid to such a point has been well rewarded in that no difficulty has been experienced in procuring contracts, as the material has always been well above the low percentage limit called for in any contract undertaken.

Fully 90 per cent of the fluorspar originating in the Jamestown district is of violet or purple color, such color being due, according to various opinions, to manganese in a manganous state; organic matter and water, which creates polarization and gives color. This color, so unlike the extensively used Illinois and Kentucky spar, has been a detriment in sales when the ore has been offered to glass, pottery, and chemical consumers of the material, although their objections are purely theoretical, and if any of these ores are ground to a fairly fine state of subdivision and subjected to about 400 deg. of temperature for a limited time, the entire purple color is dissipated and the resultant color is nearly a pure white, except when such material has pyrite present, when the yellow stain of iron oxide is imparted to the bleached material.

It must be remembered that the Illinois spar carries an intimate mixture of calcium carbonate, which cannot by any mechanical process be entirely eliminated,

whereas the silica admixture in the Boulder County fluorspar can be eliminated and grades ranging from 98 per cent and higher contained calcium fluoride are available for delivery.

A factor against fluorspar operations in Colorado is the necessary difference in freight which a Colorado shipper has to absorb in forwarding spar to Eastern consignees, and on the present rates of freight this amounts to about $3 excess to Chicago and $5 excess to New York, and on this account the prices paid on f.o.b. Boulder railroad delivery are lower by at least $4 or $5 than shipments originating from southern Illinois and northern Kentucky.

During the war plus-85 per cent fluorspar brought anywhere from $20 to $27, f.o.b. Boulder, and no shipments were made after April 1 from anyone in that district, until in July, and, as a matter of fact, I was the only shipper after Jan. 1, 1919, and have been the only shipper since business was resumed during the last summer. The price, however, had gone down for delivery under new contracts, and if the industry were to be maintained, fostered, and enlarged, there was practically no profit if any one shipper attempted to deliver metallurgical grade of 85 per cent alone.

A great deal of experimentation has been carried out during the past four months, and it can be authentically stated that today there can be delivered a spar that will run 98.15 per cent CaF_2, 0.65 per cent silica, 0.66 per cent Al_2O_3 and Fe_2O_3 and 0.31 per cent $CaCO_3$ (analysis by Illinois Steel Co., Gary, Ind.)

The production of this chemical grade of 98 per cent and over, carrying less than 1 per cent silica, is difficult to make and expensive. There is a market with the glass manufacturers for a plus-95 per cent grade, my mills making in one operation about 60 per cent plus-95 per cent and 40 per cent plus-85 per cent grade, which on the prices prevailing should make a profitable business, provided freight rates are not materially increased. Under special contract it is possible to put out a plus-98 per cent chemical grade, ground to 150 mesh, less than 1 per cent silica and less than 0.5 per cent iron.

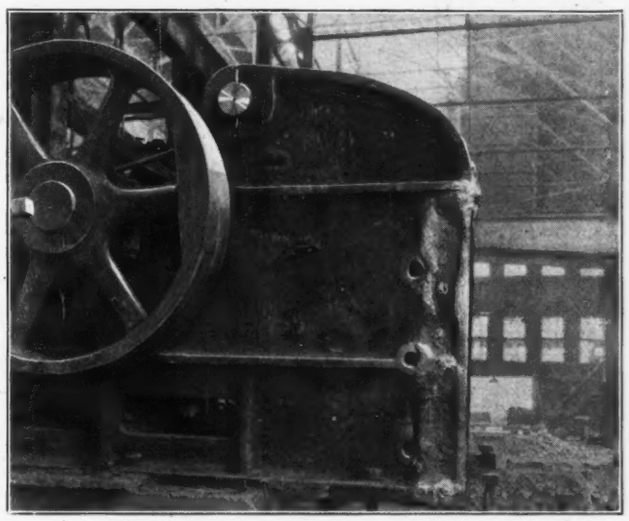
The prevailing prices of today are, plus-85 per cent grade, $13 to $15 per ton, f.o.b. Boulder; plus-95 per cent grade, $21 to $24, f.o.b. Boulder, when shipped in bulk and $24 to $28 when sacked. It would appear, however, that these figures are lower than the current prices by Eastern shippers, even with freight difference taken into consideration, and material is now being offered on a basis of $15 to $16, f.o.b. Boulder, for 85 per cent grade, and $25 to $28, f.o.b. Boulder, for 95 per cent grade in bulk, to which $4 must be added in case material is sacked.

The freedom from impurities in Boulder County spars after the silica has been removed makes them a desirabel commodity in all industries using fluorspar, and if properly sustained there appears to be no reason why a substantial and profitable business cannot be maintained in the operation and delivery of these ores.

Large Thermit Repair on Broken Crusher Side Frame

An unusually large thermit repair recently made on the broken side frame of a crusher used by the International Nickel Co., of Bayonne, N. J., is depicted in the accompanying cut. The front part of the side frame had been entirely broken off from bottom to top, a distance of 6 ft., with the exception of a fin at the top 14 in. wide, consisting of the outer flange of the casting. The broken surface of the frame varied from 3 in. to 8 in. thick, the thickest portion being where three stay-bolt holes in the casting were surrounded by bosses. The break in some places extended diagonally through the section.

Only the front plate of the crusher was removed. About one foot of the concrete and wooden base was then taken down to provide space for the construction of a wooden platform about 12 in. below the bottom of the side frame for the purpose of supporting a mold



FINISHED THERMIT WELD ON 24 X 28 IN. BUCHANAN CRUSHER

box. The gap between the two broken sections was cut out by the oxy-acetylene flame to a width of about 2½ in. and filled with wax to form a pattern. A mold box was built around the wax. Two preheating torches were directed alternately into the six heating gates of the mold box in order to burn out the wax, dry out the mold, and heat the sections to a temperature desirable for welding. The entire operation took about seven days, after which the crusher was put back into service in apparently as good condition as before.

The Production of Electrolytic Zinc

In a discussion of C. A. Hausen's paper on electrolytic zinc, recently presented before the A. I. M. E., E. P. Mathewson gave some interesting information as to the extent to which zinc is now produced by this means.

The Anaconda Mining Co. has a plant that produces daily 150 tons of electrolytic zinc. The Consolidated Mining and Smelting Co. of Canada has a plant at Trail, B. C., that was producing regularly 30 tons of electrolytic zinc per day, but during the war the capacity was increased to double that. In Australia one plant was built to produce 10 tons a day; that plant is so successful that the operating company is going to increase it immediately to a capacity of 100 tons a day. There were several small plants in the United States. One was producing 7 to 8 tons of zinc per day. The war prices for high-grade zinc, of course, assisted a good deal in the development of the process. Now that the war prices are being modified and the demand for zinc temporarily lessened, the work is greatly curtailed.

Annual Banquet of the American Institute of Mining and Metallurgical Engineers

The Annual Banquet on Feb. 17, 1920, at the Waldorf-Astoria Hotel was attended by 547 members and their wives and guests. Preceding the banquet there was a reception to Mr. and Mrs. Herbert Hoover and Mr. and Mrs. Horace V. Winchell. After the banquet a dance was held.

Report of the Institute Banquet

Hoover's Speech, Tuesday Evening, Feb. 17

THE SPEECH of Mr. Hoover was of unusual interest, in that it was plainly a nation-wide pronouncement of his views on national questions, and broke his silence on these points. The whole country will study it attentively. It follows, in full:

I have been greatly honored as your unanimous choice for president of this Institute, with which I have been associated during my entire professional life. It is customary for your new president, on these occasions, to make some observation on matters of general interest from the engineer's standpoint.

The profession of engineering in the United States comprises not alone scientific advisers on industry, but is in great majority comprised of the men in administrative positions. In such positions they stand midway between capital and labor. The character of your training and experience leads you to exact and quantitative thought. This basis of training in a great group of Americans furnished a wonderful recruiting ground for service in these last years of tribulation. Many thousands of engineers were called into the Army, the Navy, and civilian service for the Government. Thousands of high offices were discharged by them with credit to the profession and the nation.

We have in this country probably one hundred thousand professional engineers. The events of the past few years have greatly stirred their interest in national problems. This has taken practical form in the maintenance of joint committees for discussion of these problems and support to a free advisory bureau in Washington. The engineers want nothing for themselves from Congress. They want efficiency in government, and you contribute to the maintenance of this bureau out of sheer idealism. This organization for consideration of national problems has had many subjects before it, and I propose to touch on some of them this evening.

Even more than ever before is there necessity for your continued interest in this vast complex of problems that must be met by our Government. We are faced with a new orientation of our country to world problems. We face a Europe still at war; still amid social revolutions; some of its peoples still slacking on production; millions starving; and therefore the safety of its civilization is still hanging by a slender thread. Every wind that blows carries to our shores an infection of social disease from this great ferment; every convulsion there, has an economic reaction upon our own people. If we needed further proof of the interdependence of the world, we have it today in the practical blockade of our export market. The world is asking us to ratify long-delayed peace in the hope that such confidence will be restored as will enable her to reconstruct her economic life. We are today contemplating maintenance of an enlarged Army and Navy in preparedness for further upheavals in the world, and failing even to provide some insurance against war by a league to promote peace.

Out of the strain of war, weaknesses have become even more evident in our administrative organization, in our legislative machinery. Our Federal Government is still overcentralized, for we have upon the hands of our Government enormous industrial activities which have yet to be demobilized. We are swamped with debt and burdened with taxation. Credit is woefully inflated; speculation and waste are rampant. Our own productivity is decreasing. Our industrial population is crying for remedies for the increasing cost of living and aspiring to better conditions of life and labor. But, beyond all this, great hopes and aspirations are abroad; great moral and social forces have been stimulated by the war and will not be quieted by the ratification of peace. These are but some part of the problems with which we must deal. I have no fear that our people will not find solutions; but progress is sometimes like the old-fashioned rail fence—some rails are perhaps misshapen, and all look to point the wrong way; but in the end the fence progresses.

Your committees, jointly with those of other engineering societies, have had before them and expressed their views in many matters concerning the handling of the railways, shipping, the reorganization of the Government engineering work, the national budget, and other practical items.

The war nationalization of railways and shipping are our two greatest problems in Government control awaiting demobilization. There are many fundamental objections to continuation of these experiments in socialism necessitated by the war. They lie chiefly in their destruction of initiative in our people and the dangers of political domination that can grow from governmental operation. Beyond this, the engineers will hold that the successful conduct of great industries is to a transcendent degree dependent upon the personal abilities and character of their employees and staff.

No scheme of political appointment has ever yet been devised that will replace competition in its selection of ability and character. Both shipping and railways have today the advantage of many skilled personnel, sifted out in the hard school of competition, and even then the Government operation of these enterprises is not proving satisfactory. Therefore, the ultimate inefficiency that would arise from the deadening paralysis of bureaucracy has not yet had full opportunity for development. Already we can show that no government, under pressure of ever-present political or sectional interests, can properly conduct the risks of extension and improvement, or can be free from local pressure to conduct unwarranted service in industrial enterprise. On the other hand, our people have long since recognized that we cannot turn monopoly over to unrestrained operation for profit, nor that the human rights of employees can ever be dominated by dividends.

Our business is handicapped on every side by the failure of our transportation facilities to grow with the country. It is useless to talk about increased production to meet an increased standard of living in an increasing population, without a greatly increased transport equipment. Moreover, there are very great social problems underlying our transport system. Today their contraction is forcing a congestion of our population around the great cities, with all that these overswollen settlements import. Even such great disturbances as

the coal strike have a minor root in our inadequate transportation facilities and their responsibility for intermittent operation of the mines.

We are all hoping that Congress will find a solution to this problem that will be an advanced step toward the combined stimulation of the initiative of the owners, the efficiency of operation, the enlistment of the good will of the employees, and the protection of the public. The problem is easy to state. Its solution is almost overwhelming in complexity. It must develop with experience, step by step—toward a real working partnership of its three elements.

The return of the railways to the owners places predominant private operation upon its final trial. If instant energy, courage, and large vision in the owners should prove lacking in meeting the immediate situation we will be faced with a reaction that will drive the country to some other form of control. Energetic enlargement of equipment, better service, co-operation with employees, and the least possible advance in rates, together with freedom from political interest, will be the scales upon which the public will weigh these results.

Important phases of our shipping problem that have come before you should receive wider discussion by the country. As the result of war pressure, we will spend over $2,800,000,000 in the completion of a fleet of nineteen hundred ships, of a total of 11,000,000 tons—nearly one-quarter of the world's cargo shipping. We are proud of this great expansion of our marine, and we wish to retain it under the American flag. Our shipping problem has one large point of departure from the railway problem, for there is no element of natural monopoly. Anyone with a water-tight vehicle can enter upon the seas today, and our Government is now engaged upon the conduct of a nationalized industry in competition with our own people and all the world besides. While in the railways Government inefficiency could be passed on to the consumer, on the seas we will sooner or later find it translated to the national Treasury.

Until the present time, there has been a shortage in the world's shipping, but this is being rapidly overtaken, and we shall soon be met with fierce competition of private industry. If the Government continues in the shipping business, we shall be disappointed from the point of view of profits; for we shall be faced with the ability of private enterprise to make profits from the margins of higher cost of Government operation alone. Aside from those losses inherent in bureaucracy and political pressure, there are others special to this case. The largest successfully managed cargo fleet in the world comprises about one hundred and twenty ships, and yet we are attempting to manage nineteen hundred ships at the hands of a Government bureau. In normal times the question of profit or loss in a ship is measured by a few hundred tons of coal wasted, by a little extravagance in repairs, or by four or five days lost on a round trip. Beyond this, private shipping has a free hand to set up such give-and-take relationships with merchants all over the world as will provide sufficient cargo for all legs of a voyage, and these arrangements of co-operation cannot be created by Government employees without charge or danger of favoritism. Lest fault be found, our Government officials are unable to enter upon the detailed higgling in fixing rates required by every cargo and charter. Therefore, they must take refuge in rigid regulations and in fixed rates. In result, their competitors underbid by the smallest margins necessary to get the cargoes. The effect of our large fleet in the world's markets is thus to hold up rates, for so long as this great fleet in one hand holds a fixed rate others will only barely underbid. If we hold up rates an increasing number of our ships will be idle as the private fleet grows. On the other hand, if we reduce rates we shall be underbid until the Government margin of larger operation cost causes us to lose money.

We shall yet be faced with the question of demobilizing a considerable part of this fleet into private hands, or frankly acknowledging that we operate it for other reasons than interest on our investment. In this whole problem there are the most difficult considerations requiring the best business thought in the country. In the first instance, our national progress requires that we retain a large fleet under our flag to protect our national commercial expansion overseas. Secondly, we may find it desirable to hold a considerable Government fleet to build up trade routes in expansion of our trade, even at some loss in operation. Thirdly, in order to create this fleet, we have built up an enormous shipbuilding industry. Fifty per cent of the capacity of our shipyards will more than provide any necessary construction for American account. Therefore there is a need of obtaining foreign orders, or the reduction of capacity, or both. I believe, with most engineers, that, with our skill in repetition manufacture, we can compete with any shipbuilders in the world and maintain our American wage standards; but this repetition manufacture implies a constant flow of orders. It would seem highly desirable, in order to maintain the most efficient yards until they can establish themselves firmly in the world's industrial fabric, that the Government should continue to let some ship construction contracts to the lowest bidders—these contracts to supplement private building in such a way as to maintain the continuous operation of the most economical yards and the steady employment of our large number of skilled workers engaged therein.

When we consider giving orders for new ships, we must at the same time consider the sale of ships, as we cannot go on increasing this fleet. When we consider sale, we are confronted with the fact that our present ships were built under expensive conditions of war, costing from three to four times per ton the pre-war amount, and that already any merchant, subject to the long time of delivery, can build a ship for seventy-five per cent of their cost. It would at least seem good national policy to sell ships today for the price we can contract for delivery a year or two hence, thus making the Government a reservoir for continuous construction. We could thus stabilize building industry to some degree and also bring the American-owned fleet into better balance, if, as the Government sold three or four emergency-constructed cargo vessels it gave an order for one ship of a better and faster type. This would make reduction in our shipbuilding steadier and would give the country the type of ships we need.

Our joint engineering committees have examined with a great deal of care into organization of and our expenditure on public works and technical services. These committees have consistently and strongly urged the appalling inefficiency in the Government organization of these matters. They report to you that the annual expenditure on such works and services now amounts to over $250,000,000 per annum, and that they

are carried out today in nine different Governmental departments. They report that there is a great waste by lack of national policy of co-ordination, in overlapping with different departments, in competition with each other in the purchase of supplies and materials and the support of many engineering staffs.

They recommend the solution that almost every other civilized government has long since adopted, that is, the co-ordination of these measures into one department under which all such undertakings should be conducted and controlled. As a measure practical to our Government, they have advocated that all such bureaus should be transferred to the Interior Department, and all the bureaus not relating to these matters should be transferred from the Interior to other departments. The committee concludes that no properly organized and directed saving in public works can be made until such a regrouping and consolidation is carried out, and that all of the cheese-paring that normally goes on in the honest effort of Congressional committees to control departmental expenditure is but a tithe of that which could be effected if there were some concentration of administration along the lines long since demonstrated as necessary to the success of private business.

Another question of Government organization to which our engineers have given adhesion is in the matter of the national budget. To minds charged with the primary necessity of advance planning, co-ordination, provision of synchronizing parts in organization, the whole notion of our hit-or-miss system is repugnant. A budget system is not the remedy for all administrative ills; it provides a basis of organization that at least does not paralyze administrative efficiency as our system does today. Through it, the co-ordination of expenditure in Government departments, the prevention of waste and overlapping in Government bureaus, the exposure of the pork barrel, and the balancing of the relative importance of different national activities in the allocation of our national income can all be greatly promoted. Legislation would also be expedited. No budget that does not cover all Government expenditure is worth enactment. Furthermore, without such reorganization as the grouping of construction departments, the proper formulation of a budget would be hopeless. The budget system in some form is so universal in civilized governments and in competently conducted business enterprise, and has been adopted in thirty of our states, that its absence in our Federal Government is most extraordinary. It is, however, but a further testimony that it is always a far cry of our citizens from the efficiency in their business to interest in the efficiency of their Government.

Another great national problem to which every engineer in the United States is giving earnest thought, and with which he comes in daily contact, is that of the relationship of employer and employee in industry. In this, as in many other national problems today, we are faced with a realization that the science of economics has altered from a science of wealth to a science of human relationships to wealth. We have gone on for many years throwing the greatest of our ingenuity and ability into the improvement of processes and tools of production. We have until recently greatly neglected the human factor that is so large an element in our very productivity. The development of vast repetition in the process of industry has deadened the sense of craftsmanship, and the great extension of industry has divorced the employer and his employee from that contact that carried responsibility for the human problem. This neglect of the human factor has accumulated much of the discontent and unrest throughout our great industrial population and has reacted in a decrease of production. Yet our very standards of living are dependent on a maximum productivity up to the total necessities of our population.

Another economic result is, or will be yet, a repercussion upon the fundamental industry of the United States, that is, agriculture. For the farmer will be unable to maintain his production in the face of a constant increase in the cost of his supplies and labor through shrinkage in productivity in other industries. The penalty of this disparity of effort comes mainly out of the farmer's own earnings.

I am daily impressed with the fact that there is but one way out, and that is to again re-establish, through organized representation, that personal co-operation between employer and employee in production that was a binding force when our industries were smaller of unit and of less specialization. Through this, the sense of craftsmanship and the interest in production can be re-created and the proper establishment of conditions of labor and its participation in a more skilled administration can be worked out. The attitude of refusal to participate in collective bargaining with representatives of the employees' own choosing is the negation of this bridge to better relationship. On the other hand, a complete sense of obligation to bargains entered upon is fundamental to the process itself.

The interests of employee and employer are not necessarily antagonistic; they have a great common ground of mutuality, and if we could secure emphasis upon these common interests we would greatly mitigate conflict. Our Government can stimulate these forces, but the new relationship of employer and employee must be a matter of deliberate organization within industry itself. I am convinced that the vast majority of American labor fundamentally wishes to co-operate in production and that that basis of good will can be organized and the vitality of production re-created.

Many of the questions of this industrial relationship involve large engineering problems, as an instance of which I know of no better example than the issue you plan for discussion tomorrow in connection with the soft-coal industry. Broadly, here is an industry functioning badly from an engineering and consequently from an economic and human standpoint. Owing to the intermittency of production, seasonal and local, this industry has been equipped to a peak load of twenty-five or thirty per cent over the average load. It has been provided with twenty-five or thirty per cent larger labor complement than it would require if continuous operation could be brought about. I hope your discussion will throw some light on the possibilities of remedy. There lies in this intermittency not only a long train of human misery through intermittent employment, but the economic loss to the community of over a hundred thousand workers who could be applied to other production, and the cost of coal could be decreased to the consumer. This intermittency lies at the root of the last strike in the attempt of the employees to secure an equal division among themselves of this partial employment at a wage that could meet their view of a living return on full employment.

These are but few of the problems that confront us.

But in the formulating of measures of solution, we need a constant adherence to national ideals and our own social philosophy.

In the discussion of these ideals and this social philosophy, we hear much of radicalism and of reaction. They are, in fact, not an academic state of mind but realize into real groups and real forces influencing the solution of economic problems in this community. In their present-day practical aspects, they represent on one hand roughly various degrees of exponents of socialism, who would directly or indirectly undermine the principle of private property and personal initiative, and, on the other hand, those exponents who in various degrees desire to dominate the community for profit and privilege. They both represent attempts to introduce or preserve class privilege, either a moneyed or a bureaucratic aristocracy. We have, however, in American democracy an ideal and a social philosophy that sympathizes neither with radicalism nor reaction as they are manifested today.

For generations the American people have been steadily developing a social philosophy as part of their own democracy—and in these ideals it differs from all other democracies. This philosophy has stood this period of test in the fire of common sense; it is, in substance, that there should be an equality of opportunity—an equal chance—to every citizen. This view that every individual should, within his lifetime, not be handicapped in securing that particular niche in the community to which his abilities and character entitle him, is itself the negation of class. Human beings are not equal in these qualities. But a society that is based upon a constant flux of individuals in the community, upon the basis of ability and character, is a moving virile mass; it is not a stratification of classes. Its inspiration is individual initiative. Its stimulus is competition. Its safeguard is education. Its greatest mentor is free speech and voluntary organization for public good. Its expression in legislation is the common sense and common will of the majority. It is the essence of this democracy that progress of the mass must arise from progress of the individual. It does not permit the presence in the community of those who would not give full meed of service.

Its conception of the state is one that, representative of all the citizens, will in the region of economic activities apply itself mainly to the stimulation of knowledge, the undertaking only of works beyond the initiative of the individual or group, the prevention of economic domination of the few over the many, and the least entrance into commerce that Government functions necessitate.

The method and measures by which we solve this accumulation of great problems will depend upon which of these three conceptions will reach the ascendancy among our people.

If we cling to our national ideals it will mean the final isolation and the political abandonment of the minor groups who hope for domination of the Government, either by "interests" or by radical social theories through the control of our political machinery. I sometimes feel that lawful radicalism in politics is less dangerous than reaction, for radicalism is blatant and displays itself in the open. Unlawful radicalism can be handled by the police. Reaction too often fools the people through subtile channels of obstruction and progressive platitudes. There is little danger of radicalism ever controlling a country with so large a farmer population, except in one contingency. That contingency is from a reflex of continued attempt to control this country by the "interests."

The mighty upheaval following the world war has created turmoil and confusion in our own country no less than in all other lands. If America is to contribute to the advance of civilization, it must first solve its own problems, must first secure and maintain its own strength. The kind of problems that present themselves are more predominantly economic—national as well as international—than at any period in our history. They require quantitative and prospective thinking and a sense of organization. These are the sort of problems that your profession deals with as its daily toil. You have an obligation to continue the fine service you have initiated and to give it your united skill.

Horace V. Winchell's Address

RETIRING President Winchell made a notable and inspiring address. We had made arrangements to reproduce it in full, but at the last moment the exigencies of space have compelled us to omit some portions:

A year ago you were told by the same brilliant toastmaster who is providing merriment for us tonight that a geologist is personally familiar with faults and that he is an artist whose color scheme runs largely to the cerulean tint furnished by a blue pencil. He gave you serious warning of the danger which confronted you in electing as Institute president one whom he characterized as the very best mining geologist in the whole city of Minneapolis. It is now my painful duty to inform you that his vein of humor was itself faulted. This, however, was hardly a surprise, since, being only a metallurgist, he could not be expected to know that there was any other geologist in the city of Minneapolis. Hence your peril was even greater than he represented or than any one of you realized. I may also whisper to you in confidence that possibly the reason why our *Transactions* have not been embellished during the past year by even a single one of the valuable scientific treatises which we have a right to expect from so eminent a metallurgist may be found in the lurking fear of that same blue pencil which is used to indicate faults by editors as well as by geologists. And now, just to show you how lightly you esteem the advice of a mere metallurgist, here you have gone to work and elected as president for 1920 another geologist. Of course, he is a geologist emeritus, a sort of supernatural rock sharp, but we claim him as one of us, and struggle as he may, he will be a long time living it down. Indeed, I am not sure that he wishes to do so, for on looking over the list of past presidents, I notice the revered names of Rossiter W. Raymond, T. Sterry Hunt and James F. Kemp, and if that is not a galaxy of stars where will you go to find one? So, cheer up, young geologists. It may some day come your turn to be roasted on the spit

before the fire of a brilliant metallurgical toastmaster. And if a metallurgist is one who knows how to separate gold from dross, be you careful not to be the dross.

I suppose it is the natural thing for a retiring president to look backward rather than forward, and although I prefer to look both ways, yet it is sometimes profitable to cast a glance behind, for the purpose of taking account of progress and to note where mistakes have been made. And if in such retrospect real advance can be noted, surely there is all the more encouragement for the future, and greater incentive for diligent application to the work on hand. In many respects the past year has been one of intermittent industrial progress, of ups and downs, of prosperity in some lines and quiescence in others. Spurts of business have been succeeded by stagnation.

But if we take a broad view of the situation it seems to me there is mainly encouragement for us. When we contrast our position with that of the rest of the world we cannot escape a feeling of thankfulness and self-congratulation that our families and our interests are domiciled in this most happy and prosperous of countries, this Eldorado of the West. Our burdens are so light in comparison with those of the rest of mankind, our circumstances so agreeable, our surroundings and occupations so pleasant and so safeguarded by wise laws and stable government that we are indeed to be congratulated, as a nation and as individuals.

In addition to this generally prosperous condition we have the satisfaction of knowing that we have demonstrated the fundamental soundness of our institutions and the ability of a democracy to assume a dominating position and play a deciding part in a great conflict.

No one of us can fail to recognize the inevitable and eternal conflict between right and wrong, between the instincts and impulses of generosity and those of selfishness. No person or class of the community has a monopoly of either; but the conflict is ever present in one form or another, and there is some danger that materialism and desire for gain may at times blind us to the ideals which animate the real true heart of our people. We may at times neglect our duties and our opportunities to aid the common cause because we are so engrossed in our personal aims and ambitions. We may even forget that no great object is ever achieved or victory won without a struggle. We may overlook the power of united effort. In a land where, as is so well said by Mr. Hoover, there is equality of opportunity for the individual we are in danger of overlooking the value of co-operation. Indeed, we are not merely overlooking it, but have sought for twenty-five years by public opinion and through statutory enactment to discourage and prevent consolidated effort. Our efforts have been directed toward disintegration and scattering of force rather than union and consolidation. If we have learned anything from our war experiences it has been the value, nay the vital necessity, for united effort when we come into contact with world forces.

This is not a political address. It is not directed at any party nor any official of government. Incompetence and laziness are visible on all sides and are not confined to office holders. Life is easy, even though prices are high; and the higher the income the less efficient the workman, and the feebler his desire to render a dollar's worth of service for a dollar pay. What is needed is a more thorough appreciation of the reciprocal duties and relations of the laboring man and his employer, of the public service corporations and the community. The moral consciousness of the people must be awakened, not part of the people, but all of the people. And, together with such awakening, there must be simple instruction in economies which will show the people that their interests all lie in the same direction and that if the laborer is worthy of his hire, it is no less true that there will be no hire unless the one who does the hiring is also compensated.

As citizens and as engineers we have been greatly encouraged to note an increasing tendency toward co-operation and an awakening of our civic consciousness. There is an ever growing appreciation of the power for good which we possess. The influence of our leaders and their inspiring achievements during the strenuous years have worked vast changes in our conception of our public duties and responsibilities. We are boldly preparing to reach out in many directions and use our unquestioned power of analysis and constructive talents in fields where the engineer has hitherto ventured timidly or not at all. No person in the community better realizes that we must now and henceforth advance to meet world conditions. No one realizes more deeply from experience that the competition which we shall encounter both at home and abroad will be united and co-operative and backed by foreign governments with all their power.

If we as mining engineers familiar with such matters do not proclaim them from the mountain tops and compel the attention of our legislators to their importance, we shall be deemed sadly deficient in the performance of our duty by coming generations.

But we are not asleep nor negligent. We are starting new campaigns of education and entering new fields of investigation, and have been for some time active in many important lines of endeavor. Our technical committees have been reconstituted and inspired with new life; our committees on development have pointed the way to real co-operation with the engineers of other national and local organizations all over the land; we are preparing to join with the engineers of France in studying the problems of reconstruction. We are starting upon a study of the causes of defective functioning of our soft coal industry; we shall study diligently and perhaps be able to offer some constructive ideas on the labor question; we shall continue our efforts to aid the Treasury officials in arriving at just bases for the assessment of our mines for taxation; we shall use our influence to induce Congress to establish a National Department of Public Works; and the more we accomplish the more we shall be able to do. We are learning to try out our wings, and after a few successful flights shall be not only more confident in our powers but more skillful in their application. There are among our membership men whose administrative ability, experience in the conduct of affairs, and reputations as generals of industry abundantly qualify them as leaders in business and in the larger affairs of national policy. It should be our privilege and our duty to give them such solid support and such unswerving co-operation as to leave no doubt of the result. You have chosen as your president for this year a born leader, a man of broad sympathies, a direct thinker, a man of sincere devotion to his country and a man of action. Let us pledge to him our united and wholesouled devotion in the work which he plans for our Institute, for all engineers and for the whole country during the coming years.

The Toastmaster's Roasts

MR. LAWRENCE ADDICKS acted as toastmaster on the occasion of the Tuesday evening banquet. In his introductory talk he said:

This has been a most momentous year in the annals of the Institute. We have been in the midst of a situation which, were it not for the convulsions of social unrest with which life is surrounded, would have attracted the attention of the world at large. I do not refer to the desperate campaign for new members. That has gone on much as usual, except that this being leap year the annual proposal to the M. & M. Society has been omitted. Nor do I refer to the desperate situation which we found in other directions, the spread of Bolshevism, the burning of the Engineers' Club, the fact that the selling of copper appears to have become one of the lost arts.

No, I speak of the great question which has to be settled once and for all, as to whether this great Institute should adopt Simplified Spelling. The whole trouble started in the ranks of the California Hysterical Society. It appears, while most of the San Francisco members can read and write, several of them cannot spell.

Several members of the board of directors were for direct action. It was suggested that the matter could best be settled by quietly poisoning three of the San Francisco members, but Winchell has always stood for "Safety First."

So, Winchell settled the whole matter very neatly. He wrote the ballot himself. Perhaps you remember the way it read: "If you wish to vote in favor of Simplified Spelling, put a cross opposite those words which you wish to vote against." He and the secretary then toured the whole country and explained to their friends just what this sentence meant, while the advocates of Simplified Spelling were wholly at sea as to how to mark the ballot. Thus was our Institute saved by Horace Victory Winchell, who will now speak in his own behalf.

In introducing the new president, Mr. Hoover, the toastmaster said:

It is a terrible experience to become a popular hero or idol of the American people. General Sherman once said after listening for the six hundreth time to a band beneath his hotel window serenading him with "Marching Through Georgia," that, "If I had known that that campaign caused the writing of that tune I would have marched around the state instead of through it." First they begin naming things after you. Streets make a popular beginning, and while they are generally avenue or boulevards, they always run between the gas house and the glue works. Next, heroes seem to exert a peculiar fascination upon shipping, tugs, and canal boats. How your heart must swell within your bosom when first you see a scow load of mud being towed out to sea, headed by your name in full!

But the truly great soon drop their middle names. Whoever hears of Caius Julius Ceasar or Thomas Woodrow Wilson? This is done to facilitate the naming of babies after you. I don't know whether you have noticed how many "Herbs" and "Berts" are beginning to toddle around now.

Last, but not least, comes the great American sport of after-dinner speaking. Mr. Hoover has just confided to me that since he landed in America last September he has eaten one hundred thirty-two five-dollar table d'hotes, and that when he gets up from the breakfast table in the morning at the hotel he is very apt to say "Ladies and Gentlemen."

Then there is the accursed toastmaster. Mr. Hoover has been introduced as everything from St. Herbert of Palo Alto to the next President of the United States.

[The audience rose and applauded for several minutes, and three cheers were given for Mr. Hoover.]

However, before he became a world citizen he was a mining engineer. In fact, he was attached to our geological survey under Dr. Lindgren at one time. I asked Dr. Lindgren what he remembered about this association. He said, "Oh, I will never forget the trouble that fellow made for me. We were up in the California mountains, and the department strictly limited us as to rations, and Hoover ate three times his allowance and I had to charge it to mule feed."

Mr. Hoover, you are welcomed here tonight by as many as can crowd into one room on behalf of some eight thousand of your professional associates, and in choosing you as the president of the American Institute of Mining and Metallurgical Engineers, they are tendering you the highest honor in their gift, and on their behalf, I greet you this evening and present you to this audience as Herbert Hoover, American Mining Engineer.

In calling on Professor Kemp for an address the toastmaster said:

This is a sort of presidential evening. We had hoped to have with us President Carranza tonight to address you on mine taxation. But failing this, we are to do signal honor to a famous past president of the Institute. In these days of decorations, you would be interested to know that in 1895 the board of directors of the Institute created an order of merit with suitable insignia, and very suitably and happily named the order, "The Order of the Golden Fleece." You might think, from this title, that it was restricted to members from Alaska, but there is no such condition named in the deed, which stipulates merely that a candidate must be a past president of practically unblemished reputation, of an illustrious ancestry, and one who had discovered the Golden Fleece. Further, it was to be awarded not oftener than once in ten years at an annual dinner. Now, the present candidate admirably fulfills these conditions.

As to the Golden Fleece, it was he who first applied the principles of harmonic motion to geology and raised the geologist from the field to his proper place at court. Twenty years ago, no two geologists could quite agree about anything—a mere set of fault-finders, if I may so put it. Today, all the geologists on one side of the case invariably agree under oath.

James F. Kemp, D.Sc., D.L., discoverer of economic geology, past president of this Institute, Columbia man, respected even by Harvard mining graduates, by virtue of the authority vested in me by Article XXIII of the constitution, and in token of your being the most generally beloved member of the American Institute of Mining and Metallurgical Engineers, I hereby create you a member of the Order of the Golden Fleece.

Professor Kemp's Speech

IN ACCEPTING the Order of the Golden Fleece, which was the size of a meat platter and heavier, and suspended around his neck by an ox-chain, Professer Kemp said, in part:

Mr. Toastmaster and members and friends of the Institute: I am standing up under this load of honor as well as I am able, but I am not quite certain whether I am a member of the Order of the Golden Fleece or the head waiter of the Waldorf-Astoria.

This banquet is full of comfort for members of the Institute who may go broke and get hungry in the future. All that such an individual has to do is to look like a Belgian and insert himself into the Hoover field of view, and he will promptly get a square meal.

Tonight we speed the parting and welcome the coming guest. I cannot forbear to say a few words about Mr. Winchell's year of office. I have been with him through a large part of it and can say from actual observation that no president of the Institute has ever devoted himself to its welfare with greater zeal and with greater success. While Mr. Winchell has been busy underground or in the courts during the day time, the matters of the Institute have occupied many nights, and when his other duties were performed, what started him on his travels was either the meeting of the directors in the East, or the meetings of the various sections in the West. I should like, metaphorically, to take off my hat to Mr. Winchell. Mr. Winchell has climbed to the apex of official position in the Institute. He has climbed up to a number of other apexes also, some of which have got him into the courts. You may have observed that several university professors have tried to climb upon one or two of those apexes with him, and if you read the editorial outpourings of the little volcano of technical journalism out on the Pacific Coast, you will have noted that some of those professors have apparently tumbled but have not been hurt.

We welcome Mr. Hoover tonight to the presidency and we promise him in full measure the support of the Institute during his administration. To an altogether exceptional degree he commands the respect and regard not only of the members of our society, but of all the people of this and other lands. The present condition of things calls for the engineer's type of mind.

In some respect, the recent history of the Institute furnishes a close parallel with the affairs of the world at large. The United Engineering Society is very much like the League of Nations. You will remember that the oldest and richest of our national engineering societies long stood aloof, but the Institute furnished a quiet-spoken diplomatist in the person of Mr. Charles F. Rand, and now all the national engineering societies are happily housed under a single roof.

The other great problem confronting us today is the industrial problem. We are very proud that our new president is a member of the Industrial Commission now in session in Washington. We hope that his new official position in the Institute, bringing him into such intimate relations not only with our society but with the other founder societies, may aid in carrying to a practical issue whatever policies may be determined in Washington.

A. I. M. E. Woman's Auxiliary

AMONG contributing factors which made notable the 1920 meeting of the A. I. M. E. was the splendid co-operation given the Institute by the Woman's Auxiliary to the American Institute of Mining and Metallurgical Engineers, in the arrangements which were made for the entertainment of visiting members and the ladies accompanying them. The successes which have followed the efforts of the Woman's Auxiliary since its inception in 1917 have reflected most creditably on those who were instrumental in bringing the organization into being.

At the annual meeting, held on Wednesday morning, the following officers were elected: President, Mrs. Arthur S. Dwight; first vice-president, Mrs. H. P. Henderson; second vice-president, Mrs. Sidney J. Jennings; third vice-president, Mrs. Mark L. Requa; secretary, Mrs. John V. W. Reynders; treasurer, Mrs. Karl Eilers.

In a report on the activities of the Auxiliary during 1919, Mrs. William Young Westervelt, director of the New York section, outlined the work, which has functioned mainly through two committees, namely: the Committee on Americanization, of which Mrs. Jesse C. Scobey was chairman, and the Memorial Bed Fund Committee, of which Mrs. George D. Barron was chairman. The report of the treasurer, Miss Antoinette Dorr, was also read.

An Appreciation of President Winchell

In the rush to welcome Mr. Hoover as the Institute's new president, members and directors by no means forgot to feel and express their appreciation of the retiring president, Mr. Winchell.

We feel that his administration will be looked back upon as one of the virile periods in the history of the Institute and a fitting prelude to what we hope for under Mr. Hoover.

The year has been marked by a strength and vigor in the Institute corresponding with that personally characteristic of the president. Lofty and broad aims and prompt and incisive action have been the keynotes. Mr. Winchell has forever shattered what was left of some old traditions of the geologist as a dreamer, and revealed the fact that the training of the geological engineer prepares him wonderfully for the administration of affairs. Under Mr. Winchell's inspiration the Institute has inducted mining engineers into the field of public life—into the full responsibilities of citizens.

Simplified Spelling Loses in Institute

Those who have followed with interest, annoyance, or glee the heated discussion on the Simplified Spelling referendum forced by Mr. Shockley will be interested to know that the proposals have been rejected, as announced by President Winchell at the annual business meeting Tuesday morning.

Annual Dues Raised

The amendment raising the annual dues (not "raising the annual deuce" as the Simplified Spelling advocates and others would put it) from $12 to $15 was adopted at the annual meeting of the Institute on Tuesday morning.

General Engineers' Union

Institute Formally Approves of Project—Plan To Unite Engineers of Country, Whether of National or Local Societies, Into a Close Organization for the Betterment of the Profession and Political Effectiveness

AT THE annual business meeting on Tuesday morning, Prof. J. W. Richards, as chairman of a committee appointed some months ago to consider the advisability of a plan to amalgamate all engineers, made the following report, herewith presented in somewhat condensed form:

Each of the four founder societies appointed a committee on development or organization, to study the external and internal relations of these societies—their relations to each other and to the public. In the case of our Institute it consisted of three men, who were in consultation with representatives of the local sections at the annual meeting.

These four committees of the four different societies made reports to their societies, which were, as far as the external relations of the societies were concerned, and their relations to the public, strikingly unanimous in their expression of opinion that the occasion called for the organization of a representative engineering body which could act responsibly for all the engineering societies, and also associate with the other national technical societies and local engineering groups.

The principle involved is that of the representation of not only the four engineering societies, but all technical societies, in a national engineering body which shall not only embrace the representatives of these societies, professional societies, but shall also have geographical representation from local engineering groups. It is intended, therefore, that this body may be empowered to act authoritatively and responsibly for the engineering profession in the United States, both in a geographical sense and in a professional sense as far as concerns their relations with the public and the Government.

Engineering Council, at a meeting about a month ago, called together the boards of direction of the four engineering societies, and this joint meeting approved of the principle embodied in this report.

One or two of the statements from the joint conference committee will be quoted:

"The joint conference committee believes that the greatest value of the proposed organization is in the united effort for the service of the nation from which effort will result the greatest service to the individual. The committee submits the plan in the confident belief that it will be accepted by the four societies; that they will make the sacrifices necessary (that alludes, probably, to the financial side of it), and assume the responsibility of leadership, supporting the movement by virtue of their position in the engineering profession. A national movement by local societies is sure to come."

That statement is in reference to the several attempts which have been made to organize such a representative body by other agencies than these four engineering societies. There is one society in particular, the American Association of Engineers, which very actively wishes to assume the leadership in this kind of an organization.

"The four national societies can take the initiative and continue their leadership in American engineering by prompt action, or by inaction lose the prestige they now hold." Then follows the details of the national engineering organization, to which no specific name has been given in order not to hinder the organization by any prearranged name. Its component parts are the local affiliations, representing the local societies, municipal, state, and regional societies, and the national engineering and technical societies. The details are plainly matters of discussion. The principles, however, have been unanimously agreed upon.

"I would move you that the American Institute of Mining and Metallurgical Engineers, assembled in its annual business meeting, approves the principles of the report of the joint conference committee and authorizes its representatives on that committee to act with that committee in calling a meeting for the organization of the representative engineering body provided for in said report," said Prof. Richards.

In the discussion, J. Parke Channing urged the adoption of the motion, on behalf of Engineering Council, of which he is the chairman. "The one thing," he observed, "that has hampered us has been the feeling all over the country that we were not truly representative; that we only represented the four founder societies and the Society for Testing Materials, which has joined us. Now, if we can have this, what we may term larger engineering council, which is truly representative, and which takes in among its members, through various geographical and local societies, the other men of the country, the men who perhaps have not risen to the position where they are eligible to the large societies, we will better represent the engineering profession and have a better backing."

Mr. Philip N. Moore, speaking to the motion, said in part:

"Briefly, this plan proposes a representative organization, not a new organization with individual members, but a representative affair only, which shall respond to the demand, country wide, that the engineers shall have a speaking voice in the public affairs not only of the country but of their localities and of their states.

"In the end it will make for a great betterment of the position of the profession in the country. I should have said first that it will make for a great improvement in certain lines of public service. It will yield a tool by which the profession can deal with public affairs, and further, coming to our own attitude toward it, it will give every local organization in the country of dignity, which choses to exercise its privileges, an opportunity to have a voice, and there can be never again the same, 'Oh, well; that is handled in those big boards up there; they don't know what we want out here.' Every one of these organizations will have its opportunity to speak, and I firmly believe that the small concessions which it may be necessary for the founder societies to yield, a certain preponderance of numbers, will be more than made up by the greater esteem in which every integer of this great organization will hold it; and I believe that we shall obtain for any slight concessions a great return in effectiveness, respect, and value."

The motion was carried unanimously.

A. I. M. E. Industrial Organization Session

BY T. T. READ

INDUSTRIAL problems of today were the topic for discussion at the sessions of the Industrial Organization Committee of the American Institute of Mining and Metallurgical Engineers on Feb. 16. The morning session was opened by E. E. Bael, director of Americanization for the Commonwealth of Pennsylvania, who reported on progress in the work during the past year. He said that seven states have appointed directors of Americanization, New York being most advanced in its work. Mr. Bael also referred to the Kenyon bill, now before Congress, providing for making federal funds available for Americanization work in the various states allocated on the basis of their proportion of adult illiterates.

Education was the subject of a report by E. A. Holbrook, superintendent of the Pittsburgh Station of the U. S. Bureau of Mines. In regard to the education of engineers, Mr. Holbrook referred briefly to the work being done by the Society for the Promotion of Engineering Education, in the development of better methods of teaching, course content, and kindred subjects.

A report on housing was submitted by Will L. Clark. This was read, and in the subsequent discussion Dr. R. R. Sayers made the point that more knowledge of the best practice in housing is needed in the average mining community.

The afternoon session was opened by a report on mental factors in industry, by T. T. Read, chief of the Division of Education and Information, Bureau of Mines. This described the progress made during the year in the study of abnormal factors that affect industry, that was initiated by the committee and carried on under the auspices of Engineering Foundation.

Harry Tipper, manager of the Class Publishing Co., gave further details of the powerful effect interest has upon industrial fatigue, and urged the desirability of permitting a workman to carry on a variety of operations, the greater interest producing less fatigue and greater output.

The important matter of wage payment was the subject of an eloquent address by Arthur Thacher, western manager of mines for the New Jersey Zinc Co., who asserted that his forty years' experience as a mine manager convinced him that the fundamental principles of justice and equity, rightly understood, were sufficient guide to the proper course in attempting the solution of labor problems. He pointed out that political democracy was still imperfect, although it is the development of a thousand years of effort, and asserted his belief that industrial democracy can be achieved only by long and sincere effort by both the management and men.

Progress during the year in illness prevention in the mining industry was briefly reported on by Dr. R. R. Sayers, chief surgeon of the U. S. Bureau of Mines, who especially referred to the development of courses in industrial medicine at some of the principal medical schools. F. P. Lunn, assistant to the general manager of the New Jersey Zinc Co., then reported on progress in accident prevention during the year, laying stress on the work of the U. S. Bureau of Mines and the Mining Section of the National Safety Council, and urging that the Institute co-operate to a fuller degree in the work of the latter body.

Stabilization of Bituminous Coal Industry

ON TUESDAY, Feb. 17, at 2 p.m., the American Institute of Mining and Metallurgical Engineers held its first session on the "Stabilization of the Bituminous Coal Industry." President Horace V. Winchell presided, and presented for consideration plans for the participation of engineers, and especially mining engineers, in the solution of this important coal-mining problem. Herbert Hoover, vice-chairman of President Wilson's Second Industrial Conference, discussed the causes of intermittency in the production of bituminous coal, how and when the irregularities occurred, the actual number of days worked by the men at the mine during each season of the year, a possible alteration in the wage basis, actual wages received by workers during each season of the year, the question of storage in each of its phases, and the possible places of storage.

Van. H. Manning, Director of the Bureau of Mines, indicated the relative significance of the bituminous-coal problem as compared to other problems of the coal industry. He expressed his faith in the fairness of the people in viewing the coal situation, especially when they were properly informed. He said it was only natural that the public should wonder why coal costing $4.10 per ton at the mine was delivered to their bins for $12.50 per ton, and that the factors making up the price of coal should be explained to them so that they would be advised regarding the difference in price, and know who got it. Mr. Manning said an effort was being made to educate the people in this respect.

Mr. Winchell thought that publicity from producers alone was not sufficient, and that trained engineers should be employed to get the facts so that the people would be informed by thorough and unbiased investigators.

George Otis Smith presented a statistical analysis of the fluctuations in bituminous-coal production, their extent and causes. He referred to the shortage of labor, and the relative effects of shortage of transportation and lack of market.

Sidney J. Jennings discussed the human factors in coal production, and pointed out that the bulk of our coal was mined by foreigners, representing about twenty-seven nationalities, and speaking eight different languages. He pointed to the future possibility of increased production, and thought that the labor requirements might necessitate, or make desirable, the use of Chinese labor for a limited time.

In taking exception to this proposal to import Chinese labor, H. V. Winchell suggested that mechanical devices be developed so that we could get along with fewer men in the mining of coal. Herbert Hoover also protested against the employment of Asiatic labor, and insisted that we should devote our attention to increasing the efficiency and well-being of people who could be absorbed into our national life.

Messrs. Thatcher and Ludlow discussed the question of the production of coal per man, and the fact was brought out that it was common for good miners under favorable conditions to shovel from 50 to 70 tons of coal per shift, and that records up to 112 tons per shift had been made.

The problem was discussed further by Messrs. Smith, Hall, Morris, Rice, Breckenridge, Hudson, and others.

Metals Division

Papers on the Crystalline Structure of Lead and Copper Bring Out Some Interesting Discussion—Advantage of Hand Pouring Wire Bars

ONLY one session of the Institute of Metals Division on Non-Ferrous Metallurgy was held at the New York convention, that being on Tuesday morning, W. M. Corse presiding. Three papers were read, two by Henry D. Rawdon on the intercrystalline brittleness of lead and copper, and one by Frank L. Antisell on the "Relationship of Physical and Chemical Properties of Copper."

Discussion of the first two papers was initiated by Dr. J. W. Richards. The explanations, as given in the papers, he declared to be unimpeachable. He also spoke of the dusty effect which is produced when lead is used as a cathode in an alkaline solution with high current density. The lead is very finely divided, looks like ink, and takes several hours to settle. It may be used to absorb the gold and silver in sea water, allowing the determination of very small quantities. Its use on a commercial scale to extract the precious metals from sea water would, however, cost as much as the products were worth.

Dr. Jeffries spoke of the work done by several English investigators on the subject of intercrystalline brittleness, and stated that long exposure to load was the principal causes of increase in this phenomenon. Other contributing factors are the presence of brittle eutectics and the difference in the specific properties of the various crystalline substances. G. H. Clamer brought up a practical question which is puzzling the railroads. The bearing linings on railroad cars crack, according to Mr. Clamer, after several years' use, and cause considerable extra expense for their replacement. These were formerly made of pure lead, but now the lead is hardened with tin and antimony. Intercrystalline brittleness was suggested as being a likely cause. F. A. Hall mentioned having had the same trouble with aircraft motor bearings, especially the bronze and babbitt bearings of the Wright-Martin machines. Dr. Richards then explained the fundamental reasons for some of these phenomena, using the blackboard for illustrations.

In the discussion following Mr. Antisell's paper, W. R. Webster pointed out that the standards of copper have declined in the last twenty-five years. He spoke of the excellent copper turned out by the Bridgeport Copper Co. in the old days when small furnaces were used. Prof. Arthur L. Walker stated that the principal difficulties are physical rather than chemical. The bending test suggested by Mr. Antisell should be supplemented by a conductivity test, for copper with a small percentage of arsenic would pass the former, but not the latter. Professor Walker mentioned that one lot of wire bars had been condemned because of cracks due to the method of pouring. These occur when the pouring is all done in one place and indicate the necessity of spreading the pour over the entire mould. The advantage of hand pouring is evident.

Mr. Antisell took exception to the statement that the copper formerly made was of better grade. He pointed out that the metal was used largely in mechanical work where the presence of arsenic and oxygen is an advantage. Now, copper is used principally for electrical purposes for which an exceedingly pure metal is required; in fact too pure for other work.

Mining Geology

Growth of Lead Ore; Facts Concerning Rock Pressure—Mogollon District, New Mexico—Discussion at Session on Mining and Geology

THE PAPERS presented to the section on mining and geology at the New York meeting proved interesting and evoked much discussion. The chief discussion of the morning session was brought about by H. A. Wheeler's brief paper on "Rapid Formation of Lead Ore," in which the formation of galena crystals on iron tools in the Mission mine since 1914 led to the conclusion that most if not all of the Mississippi Valley lead and zinc deposits are very young, at least not older than Tertiary, and perhaps Quaternary, in age.

In the very general discussion that followed, Professor Kemp pointed out the usual action of weathering and oxidizing waters on the lead and zinc sulphides, leading to the formation of lead carbonate in place and the deposition of zinc silicate on and within the crevices of the underlying rock, whereas we find little or no evidence of the downward movement of the sulphides themselves.

Mr. Winchell cited an example of "a mine upside down," in which unaltered galena filled the upper portion of the vein, with extensive oxidized ores below.

Mr. Bateman described an occurrence of native copper with attached chalcocite in an Alaskan glacier, but referred both the sulphide and the native metal to veins found later in the neighboring rocks. Mr. Lindgren spoke of well-known instances of deposition of galena and blende along with calcite and barite, from the brines of Louisiana, the wells sometimes becoming clogged with the substances, the origin of which he attributed to the mingling of two solutions, one perhaps contained lead chloride and the other hydrogen sulphide. Mr. Ball called the attention of those who are looking for a possible deep-seated source of the Mississippi Valley lead and zinc ores to Buckley's report on the southeastern Missouri region, in which he describes the occurrence of limburgite dikes containing galena and blende fifty miles northeast of the lead deposits of St. Francis County.

David B. Scott's paper on "The Ore Deposits of the Mogollon District, New Mexico," was presented in abstract by Mr. Ball, and discussed by Professor Bateman and Mr. Ferguson, of the U. S. Geological Survey. The latter presented an alternative explanation of the ore deposition, as related to the ancient topography, attributing it instead to the change in character of the wall rocks. F. G. Wright's paper on the "Examination of Ores and Metals in Polarized Light," called attention to important methods recently worked out, which should prove a valuable supplement to the usual observations of color, differences in hardness, etc., in the determination of opaque minerals. The methods of study of sky polarization were found directly applicable.

The afternoon session was devoted to H. C. Moulton's paper on "Earth and Rock Pressures," in which the author called attention to wide discrepancies found in practice with the usual formulas based on an assumed angle of repose. The extended and lively discussion, participated in by Messrs. Means, Briggs, Ridgeway, Tillson, and others, showed the general interest in the subject and its practical bearings on the problems of tunneling, stoping, and quarrying.

The Milling and Smelting Session

Only a Limited Amount of Discussion Followed the Four Papers Which Were Presented On Tuesday Afternoon

MOST of the millmen and operating metallurgists are engaged in districts remote from New York City, and the attendance at this meeting was therefore somewhat slim. The presence of Mr. Hoover at a contemporary session also served as a strong counter attraction.

F. P. Dewey's paper on volatilization losses in assaying was commented on only by Dr. Richards, who mentioned the impossibility of determining the relative amount of metal actually volatilized and that mechanically carried over by dusting. An alloy containing 20 per cent of silver will, for instance, carry a great deal of the precious metal away as fume. Dr. Richards maintained that the statement of Mr. Dewey that "various metals show vapor pressure below their melting point" should be amplified to include all metals at all temperatures. To this Mr. Dewey refused to agree.

An abstract of the paper by Frederick Laist and H. J. Maguire on the Anaconda reverberatory furnace for cleaning converter slag was read by the Chairman, E. P. Mathewson. Discussion followed in which Messrs. Mathewson, Miller, and Maier participated.

The development of means for the reduction of magnetite was generally accepted as being of the utmost importance, as the research work on the Copper Queen slags has proved that sulphur dioxide acts as a flotation medium for the entrained copper, and the formation of this gas is promoted by the presence of magnetite.

R. E. H. Pomeroy's paper on the coal pulverizing plant at the Nevada Consolidated was also read in abstract form.

The description of the milling plant of the Alaska-Gastineau brought out a question as to the practicability of the five-ton automatic skips installed there. These skips, it was pointed out by W. L. Remick, were unsatisfactory at first. They are operated with a flat cable instead of a round one. Trouble was encountered with the tripping device at the bottom of the skip, as the blow could not be regulated. This was remedied by installing a dash pot to slow up the speed of the skip gradually.

Mr. Remick also indicated that roll crushing at this mill had been more satisfactory than that with ball mills at the Alaska Juneau.

The Mining Taxation Section

The session on Mining Taxation on Tuesday morning, presided over by J. Parke Channing, was followed with interest. It was devoted chiefly to general discussion of principles.

Among the principal speakers were Mr. Arthur Thacher and Mr. Norris, both members of the special committee on Federal taxation which has been conferring with the Treasury Department officials in order to secure the most equitable tax rules possible as regards the mining industry.

It is also known that members who were not present are far from satisfied with the attitude of the Government as regards the administration of the mine-taxation laws; and that they feel that these laws should be more intelligently framed and interpreted.

Gold Medal Given Hoover by Civic Forum

The New York Civic Forum presented a gold medal to Herbert C. Hoover on the evening of Feb. 18, at Carnegie Hall. The award was made to him as the American who has performed the most distinguished public service in the last two years. Previous awards of the medal have gone to Alexander Graham Bell, General George Goethals, and Thomas A. Edison.

Charles Evans Hughes made the presentation.

Horace V. Winchell, who was succeeded on Feb. 16 by Mr. Hoover as president of the American Institute of Mining and Metallurgical Engineers, began his address on Herbert Hoover with a three-stanza poem, which he entitled "Hail, Hoover."

Mr. Winchell's address revealed that after the armistice, Mr. Hoover, with the aid of his assistants in every country of Europe, collected literature of the war. The material thus gathered makes a library of 80,000 documents and includes many original staff and government reports and much correspondence of a confidential nature. Mr. Winchell said Mr. Hoover had given this library to his alma mater, Stanford University.

"As a result of this generous benefaction," said Mr. Winchell, "the history of the Great War will be written in this country, and hither for generations will come students of this great subject from all parts of the globe."

The Smoker

The smoker is always the best part of the A. I. M. E. meetings. The entertainment committee included in Monday evening's program a description of a marvelous device, known as the "stanniphone," the tin prospector's friend. The inventor of this instrument is Major Rodney Deere, a fellow of the Royal Hypothetical and Hieroglyphical Society, who served under his country's flag during the late conflict as Inspector General of Nursing for War Babies. Through this device, while prospecting in Ontario, Major Deere succeeded in uncovering a tin lizzie under very adverse geological conditions.

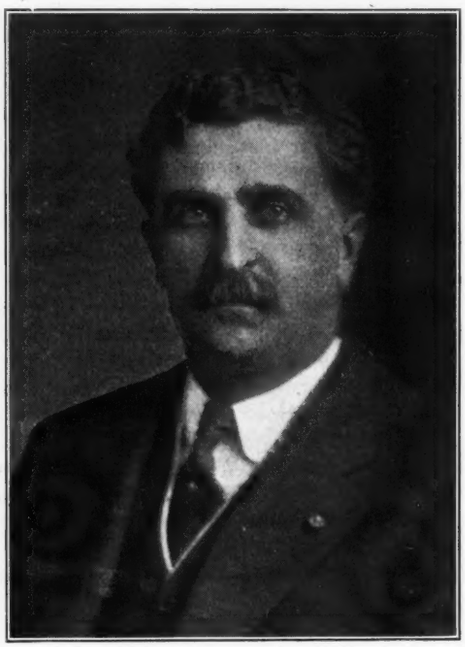
Bush Terminal Visit

The inclement weather made it impossible for most of those who expected to visit the Bush Terminal on the last day of the meeting to make the trip. About 250 had signified their intention of going, but, on account of the snowstorm, only about fifty visited the warehouses.

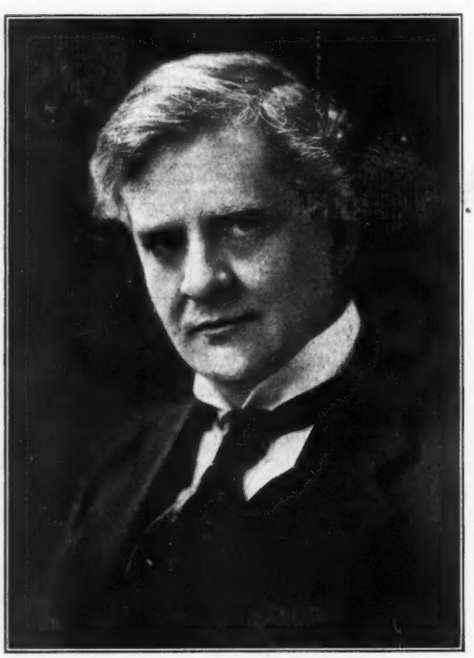
The first building to be visited was that occupied by the United Cigar Stores Co., and here all of the tobacco used by this company in the eastern district of the United States is handled. The party next visited the manufacturing plant where Lily paper cups are made, and afterward the pier of the Hawaiian-American Steamship Co. A buffet luncheon was served at the Longshoremen's Club, after which the Bush Terminal Hospital, Y. M. C. A., and other works of a social nature maintained by the Bush Terminal were inspected. The final object of interest was the paper plant at the Tidewater Paper Mills Co., where the paper used by the New York *Times* is manufactured.

Interesting Men in the Petroleum Industry

VAN. H. MANNING
Director U. S. Bureau of Mines



GEORGE OTIS SMITH
Director U. S. Geological Survey



A. C. VEATCH

RALPH ARNOLD

THE PETROLEUM INDUSTRY

Oil Land Leasing Bill

THE conference report on the Oil Land Leasing Bill has been reported out of committee and agreed to by both Senate and House. It is now up to President Wilson. If signed, it becomes a law. This substantial agreement by both Federal legislative branches represents the termination of a struggle extending over a period of eight years or more. It is a significant event in the history of mining in our country, for it marks the beginning of the end of an interval during which the exclusive ownership for certain mineral-bearing land could be obtained by location, the performance of certain work, patenting, and purchase from the Government. It removes the uncertain precedure of locating, under the placer law, saline, petroleum and gas, and phosphate deposits. It definitely introduces the system of prospecting permit applying specifically to a given area selected by the prospector and, on discovery taking place, gives the prospector the right of leasing under royalty payments and rental, included as part of the royalty payment, a part of the land embraced by the discovery. It also settles the status of claimants of oil lands existing within areas withdrawn by Presidential action and provides for the return of impounded moneys.

Opposition to the leasing under the royalty payment plan was ostensibly caused by the feeling that individual state rights were in danger of invasion incident to Federal control. The real opposition was due to the feeling that when a prospector made a discovery and developed it to the point where commercial production resulted he was entitled to the whole return, less the customary taxes. The equity of the public was not considered. The present act may be said to establish the rights of the public to participate in the returns from the individual's efforts where that individual has acquired permission to test and extract the mineral from the given tract of public land. This act applies specfically to coal, phosphate, oil and gas, oil shale, and sodium salts. Of all moneys received from sales, bonuses, royalties, and rentals, excepting those from Alaska, 10 per cent will go to the Treasury of the United States, 52½ per cent to the U. S. Reclamation Fund and 37½ per cent to the state within which the leased lands are situated.

Petroleum Session of the Institute

BOTH Van. H. Manning and George Otis Smith, respective directors of the Bureau of Mines and Geological Survey, struck similar notes in their papers on petroleum presented at the New York meeting of the American Institute of Mining and Metallurgical Engineers. We present Mr. Manning's paper in abstract. Mr. Smith advocates greater attention to conservation of present domestic oil resources by a campaign of economy. He says:

"A country-wide thrift campaign needs to be waged looking to the saving of this essential resource. Man power and oil ought to be conserved all along the line of production and consumption by better methods in the discovery, drilling, recovery, transportation, refining, and use of petroleum and its products. Unwarranted optimism, which seems indigenous in most parts of the United States, has led both the oil industry and the public to waste this best of fuels; the program of wastage begins with leakage below ground and above ground and continues to the indiscriminate burning of fuel oil under boilers, with regard for convenience rather than for efficiency."

On the subject of obtaining a future supply of petroleum and the simplification of relations with foreign countries engaged similiarly in acquiring control of new sources of supply, Mr. Smith has the following significant suggestions:

"Two methods of handling the problem of a future oil supply suggest themselves: either reserve the domestic oil fields for American development and thus prevent foreign acquisition of what is needed at home; or, encourage our capital to enter foreign fields to assist in their development, thus insuring an additional supply of oil for our needs. The one method harks back to the 'Chinese wall' period, the other expresses the 'open door' policy. At present the United States Government follows neither method; the British government has adopted both.

"The British Admiralty led the way in its appreciation of the advantages of fuel oil, and the British government has led the way in assuring to its nationals control of oil resources wherever found on British territory. Advantages that American capital may once have held in Trinidad and elsewhere in the British Empire are not now enjoyed and British enterprise is narrowing the field of opportunity in Mexico, South America, Mesopotamia, and Africa. Be it said, moreover, to the credit of British efficiency and foresight, that British capital has made generous use of American brains in discovering and developing its oil properties. American geologists, American engineers, American drillers, and American rigs and supplies have been utilized in British oil exploration, and we may well reciprocate by adopting the British policy of encouraging the acquisition by its nationals of petroleum supplies in foreign fields. American capital as well as American engineering should be encouraged to help develop the new fields and so do its part in insuring the continuance of this source of power for future generations at home and abroad.

"The part of the Government is to give moral support to every effort of American business to expand its circle of activity in oil production, so that it will be coextensive with the new field of American shipping. This may mean world-wide exploration, development, and producing companies, financed by United States capital, guided by American engineering, and safeguarded in policy because protected by the United States Government. Thus only can our general welfare be promoted and the future supply of oil be assured for the United States."

This is sound doctrine. It is essentially American in spirit. It points out the need of the Governmental support of American enterprise abroad. In the past this has been the weakest part of our foreign policy. We feel that, unless the Government vigorously lines up with American foreign enterprise, there is little point in advising Americans to embark in foreign enterprise.

International Aspects of the Petroleum Industry*

BY VAN. H. MANNING
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IN SUBSTANCE, the international aspects of the petroleum industry, as these relate to the United States, are as follows: The domestic production is not keeping pace with domestic demands; our best engineering talent warns us of the imminence of a decreased production by our oil wells, although more oil is needed; and the only practical source whence this increasing demand can be supplied for some time to come will be the foreign fields. Other nations have given thought to the future and, in recent years, have shown a tendency to adopt strong nationalistic policies regarding their petroleum resources, policies that hinder or prevent the exploitation of these resources by other nationals. In consequence, we find that, facing a probable shortage of the domestic supply, our nationals are excluded from foreign fields; and this in spite of the fact that foreign nationals have been permitted to enter into and exploit our own oil resources on an equality with American citizens and without hindrance or restrictions. This country has supplied the larger part of the petroleum consumed by the world, and yet, with a failing supply imminent, it finds that those countries that have been drawing upon our resources to supply their needs are showing a tendency to exclude us from their resources. In this way we shall be transferred from a position of dominance to one of dependence; and only by sufferance of those countries that are now seeking financial or political control of petroleum supplies, shall we be able to obtain the oil we will need.

OUR PETROLEUM RESOURCES

The United States was the first country to produce oil in large quantities by the modern system of drilling wells, and, except during a few years, has led all the countries of the world in the quantity of its production. In 1914, when the Great War began, the United States was in first place and produced approximately 266,000,000 bbl. of oil, or about 66 per cent of the total output of the world. Russia was second, with an approximate production of 67,000,000 bbl., or about 17 per cent of the world's total. Mexico came third with about 21,000,000 bbl., or a little over 5 per cent of the world's production. Rumania, the Dutch East Indies, India, Galicia, and Japan produced comparatively small amounts of oil, totaling approximately 12 per cent.

The vital importance of petroleum had not been fully recognized by the leading countries of the world, so the United States occupied a unique position, practically without competitors. Foreign countries had not begun to consider seriously future supply and there was less rivalry in gaining control of possible oil fields. Yet signs of an awakening interest were evident. Great Britain, because of having adopted fuel oil in the Navy, had begun taking steps to assure, through British nationals, an adequate supply of oil from Mexico and to encourage development in British domains. The British government had also entered into partnership with the Anglo-Persian Oil Co. to exploit a huge concession in Persia.

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The point of real importance, however, is the relative position of the United States as a consumer rather than a producer of oil. To produce the bulk of the world's production is of small consequence in comparison with producing enough to meet our present and probable future needs. In 1918, the output of crude oil in the United States was 356,000,000 bbl. Mexico had taken second place with 63,000,000 bbl. The production of the United States for the past several years has been approximately 65 per cent of the world's total. The approximate consumption of the United States for the year 1918 was 406,000,000 bbl., or more than 80 per cent of the world's production. This figure of consumption, however, includes the oil that was refined or partly refined in the United States and exported for consumption abroad. The exports of petroleum products approximated the imports of crude petroleum from Mexico and other foreign countries. But in addition, some 20,000,000 bbl. of oil were withdrawn from domestic storage. In substance, therefore, the United States, in 1918, was living beyond its means. The year 1919, because of the present flush production from Texas fields and the increased imports from Mexico, finds the United States in a somewhat more favorable condition, not having to draw on stocks; yet it must be remembered that the stocks have not only decreased actually but have decreased in proportion to our production and consumption. Thus, in 1915, there was over six months' supply of oil in storage, whereas at the end of 1918 stocks had been reduced to less than four months' supply.

The U. S. Geological Survey has given the following figures of the marketed production and consumption in the United States. The figures for marketed production approximate, but are not the same as, actual production:

	Marketed Production, Barrels	Consumption, Barrels
1916	301,000,000	329,000,000
1917	335,000,000	384,000,000
1918	356,000,000	418,000,000

Evidently the production of the United States, in spite of its having risen steadily during recent years, is not rising as rapidly as it should and is not keeping pace with the increase in consumption. The sources from which we can draw for our future needs of petroleum and its products are: Our own oil fields, foreign oil fields, oil shales, and substitutes for petroleum products. Engineers and geologists who have investigated the possible oil underground in our developed and undeveloped oil fields agree in making pessimistic reports. This is particularly true of the U. S. Geological Survey, the organization that has given most attention to our petroleum resources and has the most facts. The U. S. Geological Survey estimates our unproduced but recoverable oil in January, 1919, at 6,740,000,000 bbl. This, could it be produced as needed, would not continue our present production of oil for more than twenty years.

Many persons, especially non-technical oil men, are inclined to question these estimates and call them too pessimistic, saying that whenever in the past more oil was needed new discoveries were made and unexpected fields brought forth new supplies. However, our best-

informed engineers have given this estimate, and their belief should outweigh the vague optimism of those who question it. Of course, in view of the fallibility of estimates, the figures may prove to be too pessimistic. Even if the estimates of the supply of unrecovered petroleum were 50 to 100 per cent too low, the situation would still not be satisfactory. And the fact remains that no matter how much oil there may still be in the ground, we have not been and are not getting it to the surface as fast as it is now needed.

Clearly, we must seek other sources of supply to make up the balance between domestic production and domestic needs. Enormous deposits of oil-bearing shales occur in the western states, in the Cretaceous formations of the Rocky Mountain region. The U. S. Geological Survey estimates that the shales in the states of Colorado, Wyoming, and Utah alone contain many times the recoverable oil present in our oil fields before well drilling began. But the oil in these shales is not immediately available. The extraction of oil from the shales on a commercial scale under existing conditions in the United States is still in an experimental stage. We do not know, as yet, whether these shales can be developed profitably under present conditions, nor under what conditions they can be developed. Furthermore, it will take many years, even under favorable conditions, to obtain from these shales enough oil to replace a considerable part of that now obtained from wells.

SUBSTITUTES

The products from the destructive distillation of coal can be used, in so far as they are available, to replace gasoline; but quantitatively it seems out of the question to expect more than a minor alleviation from them. Coal can largely replace fuel oils. Alcohol can replace gasoline and has the advantage that it can be made from replaceable material—that is, from plants; but because of its cost, it cannot compete in a large way with gasoline at present. Moreover, the difficulty and expense of replacing any considerable part of the gasoline supply by alcohol is not generally appreciated. Finally, no substitutes are now known that will satisfactorily replace mineral lubricants in the quantities needed.

Thus, the facts indicate that we must inevitably seek foreign supplies in order to meet our needs and to compete in the world's markets without too great a handicap. However, we should not rely upon any one solution of the problem, but should seek to put into effect every feasible means that promises to help, and should strive to anticipate our future needs rather than to go along blindly with the inevitable result of suddenly being confronted at some future date with a shortage of oil. Steps should be taken to conserve our developed supply. This supply is tangible; we already have it, and common sense dictates that we take the best possible care of it. By conservation I do not mean the tying up of resources, but a wise utilization, the working out of methods that will yield us the greatest quantity of oil at the least cost and will enable us to refine and use the oil with the highest efficiency. This phase of the question is peculiarly a part of the work of technical men, and I believe that this Institute should seriously endeavor to further, in every possible manner, the application of engineering methods to the oil business, for the oil industry is probably more backward in applying engineering knowledge than any other mineral industry.

Recently, the U. S. Geological Survey has shown a particular interest in questions of foreign supply, and has rendered a splendid public service by collecting all possible information on the subject. In the opinion of the Survey, enormous resources await development in various parts of the world; but these resources have not been developed as intensively as those of the United States.

The key to the future is access to the sources of supply. The strong financial position of the petroleum industry in this country, and the refining and marketing facilities of the strongest American companies will not, by themselves, suffice if we are at the mercy of the citizens of other nations for our crude supplies.

TENDENCY OF FOREIGN COUNTRIES TO EXCLUDE OTHER NATIONALS

One result of the war has been an accentuation of nationalistic spirit; the nations that were combatants and those that were neutral have shown increasingly a tendency to exclude other nationals from their domains and to develop their own resources by their own interests.

The United States is not an imperialistic nation, and, exclusive of Alaska, its foreign possessions are with small potential resources. Thus we find no political control of consequence over other than the domestic sources of supply within the United States proper. When we turn to the developed or prospective oil fields in other parts of the world, we find that their political control may be grouped under two heads: Colonies and domains of such nations as England and France, and domains of smaller nations, such as the Latin-American countries, China and Persia; under present chaotic conditions perhaps Russia could be included. The most promising oil districts now known outside of the United States are in Mexico, in the South American countries bordering the Caribbean, in Equador, Peru, Bolivia, Argentina, northern Africa, Egypt, Persia, Mesopotamia, Palestine, Russia, India, the East Indies, and China. There are other localities of smaller promise or about which less is known, and doubtless some of these will develop fields of the first magnitude when explored and prospected.

When one reviews these potential oil fields, one is struck with the fact that Latin America, Great Britain, France, and the Netherlands apparently control the main potential sources of supply, and particularly those that are of the most concern to the United States. Thus, the policies of these countries are of the greatest interest to America. We find England and France adopting policies, already in part incorporated into laws or regulations, that now virtually exclude other than their own nationals from developing the resources within their own realms. Of course I do not mean to insinuate that the policies of these countries are aimed directly at Americans; the policy of each country is to look after its own citizens; hence it is directed against the citizens of all other countries, and thus affects Americans.

A review of the foreign situation, therefore, discloses the fact that whereas other nationals can enter our oil fields, acquire properties there, and work these properties on an equality with ourselves, our nationals are not receiving reciprocal privileges from many foreign governments now controlling the most important oil regions of the world, and thus in time we are likely to be largely dependent on those governments for our

domestic needs. Moreover, conditions in the Latin-American countries are not as satisfactory as they might be. The question comes, therefore, as to what should be done toward removing discrimination under which Americans are practically excluded from foreign oil fields. It is not for me to discuss here such a question in detail, but it is perfectly obvious that in all fairness our nationals should be accorded the same privileges that we accord other nationals. It has not been the policy of the United States to exclude foreign corporations or individuals; in fact, they have been welcomed, as it has been recognized that the capital brought in has been, in a large way, helpful to the United States even though the profits went mostly to the benefit of other nationals.

I may also urge the opportunities and national importance of American concerns entering foreign oil fields. Evidently this country is going to need foreign sources of supply, and it will be to its great advantage to obtain these through its own nationals. Heretofore, American methods, American machinery, American brains have been employed by foreign capital to develop foreign resources. It will be more desirable if our brains and abilities are employed under our own nationals.

It is desirable that every engineer realize before accepting employment with any foreign corporation competing against ours, just what this means. I believe it should be made a policy of the members of this Institute to see that the younger engineers and those unacquainted with foreign conditions are informed of this matter.

Genetic Problems Affecting Search for New Oil Regions*

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IN THESE DAYS, when detailed investigations of stratigraphy, structure, and sand conditions so frequently result in the discovery of new oil fields, and applause from oil companies and the public, geologists do well to walk humbly, and punctiliously to admit that the geologic principles controlling the distribution of oil and gas have as yet been discovered only in part, and that what remains yet to be learned is probably vastly more than what is already known.

Most oil and gas geologists agree that in those formations in which oil is found there must be sufficient organic matter genetically to account as mother substance for the oil, which is believed to have escaped from its mother rock into some suitable and accessible reservoir rock where it is confined beneath impervious strata. However, little seems to be known as to the requisite quantity of mother substance or as to the maximum distance at which this substance may be situated from the reservoir.

Most geologists assume that this mother substance is carbonaceous, but others hold that recognizable carbonaceous debris or visible residues are not necessarily present. "Bituminous" or other carbonaceous shales and limestones are almost invariably searched for because, seemingly with good reason, such deposits are regarded as the principal materials from which petroleum may be generated; certainly they are the rocks from which oils nearest to typical petroleum may be artifically produced by distillation. As shown by Orton and others, similar carbonaceous matter adequate for supplying oil and gas may be found in most regions disseminated through the rock or concentrated in certain layers; it is present in ample amounts even in less distinctly carbonaceous shales and limstones, and in some sandstones, and there seems no room for doubt that oil in commercial amounts has been derived from such deposits. Most dark limestones, sandstones, and shales, as well as ordinary black shales, owe their dark tones to the presence of carbonaceous residues, which are easily recognized under the microscope. Yet it remains to be seen how much of such organic matter is requisite, as a minimum—probably, in reality, an average minimum. Circumstantial evidence—the conditions actually presented in certain oil fields—seems to indicate that the carbonaceous matter need compose but a very small percentage of a supposed mother formation, if the matter is of the right sort, and if other requisite conditions are fulfilled, and that a very great thickness of the mother formation is not indispensable. In general, however, our most productive oil deposits are found in districts containing formations in which there is evidence of abundant life, with ample vegetal matter. That only smaller productions are found in districts containing little carbonaceous matter may prove to be a rule with numerous exceptions.

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Carbonization of the Organic Matter in Oil-Bearing Formations

A study of the incipient regional metamorphism of carbonaceous deposits in the coal and oil fields of the United States and other countries shows that no commercially important oil fields have yet been discovered in any area where the fuel ratios of the coals, occurring in the formations in which oil is sought or in overlying formations, exceeds 2.3. The progressive devolatilization by which the coals in any region or formation have been transformed from peats to lignites, bituminous coals, and finally to graphite, is the first indication of incipient metamorphism of the rocks of the area. The proximate analysis of the coal or coaly deposits, as the writer has shown, is a sort of "ultra-violet" method of observing this initial stage of regional metamorphism of the ordinary type. Other attending criteria include the stages of dehydration, consolidation or lithification, development of jointing and cleavage, and, in due time, schistosity and mineralization.

More observations and tests are necessary to fix more exactly the stage of regional alteration beyond which commercial oil pools, though formerly present, will not have survived, but it is probable that the limit falls, in general, slightly lower than the point at which coals of the ordinary bituminous type show a fuel ratio of 2.2 or 68 per cent of fixed carbon in the pure coal; it may

approach nearer the ratio of 2.0, or 66 per cent fixed carbon.

It is important that, in a new region under consideration as to oil possibilities, every precaution be taken to ascertain whether the alteration of the rocks, as indicated by the stage of carbonization of the carbonaceous deposits, has not gone so far as to preclude the survival of oil in commercial amounts. As I have shown in the papers already cited, drilling in regions of greater metamorphism will find only gas or mere showings of "white oil"—approximately kerosene—generally little more than samples, and nowhere in commercial amounts. This principle appears to be proved by thousands of tests in the Appalachian field, in the Mid-Continent region, and in other parts of the world.

Oil in commercial amounts should not be expected in the Devonian of east-central and southeastern New York and eastern Pennsylvania; in the Paleozoic regions of Georgia; in the Arkansas coal field; nor in those areas or northeastern Kentucky, of eastern Tennessee, of Alabama, of the Paleozoic region in southeastern Oklahoma, and portions of New Mexico, Colorado, Montana, Utah, and Washington, as well as of Pennsylvania, Maryland, Virginia and West Virginia, where the regional carbonization has passed the stated limit. The Utica, Genesee, Hudson, Ohio, Chattanooga, and Woodford shales are splendid depositories of mother substance, but it is futile to search for oil in the associated "sands" in regions where the organic matter of these shales is too far altered.

Folding of the strata, or the development of structure, is almost universally regarded as an essential feature of any oil region. The migration and "gravitational" segregation of oil, gas, and water are commonly supposed to be connected with the existence, if not indeed with the origin, of folds, and in particular with minor local anticlines and domes. Therefore, folding is always looked for and analyzed in detail.

However, to what extent and through what processes folding operates as a cause, or a means, or, on the other hand, whether it is to be regarded only as an effect or a mere indication, is yet to be shown. Most of us hold that folds facilitate the segregation and localize the distribution of oil and gas pools, and are therefore of great consequence in the search for new oil fields; contrasted with this view, folding seems to be regarded by some geologists mainly as an effect of questionable importance.

As noted in my discussions of coal, regional carbonization results from the progressive devolatilization of carbonaceous matter in the strata on a regional scale under dynamic stresses, dominantly horizontal thrusts, probably with development of moderate temperatures. It is most advanced in the regions of apparently greatest thrust compressions, and hence of greatest molecular displacement; and in any region it is seen to be greatest on the side of greatest cumulative and sustained horizontal stresses.

With reference to both carbonization and folding, it is important for a field geologist, prospecting for oil in new region, to remember that folds are likely to mark lines of pre-existent weakness resulting from former anticlinal buckling or faulting in the deeper strata, or that they may occur in zones of less competence, such, for example, as along zones of marked or abrupt unconformities; also that buckling and, in particular, overthrusts are the structural changes (really strains) that compensate and relieve the pressure stresses and tend to neutralize them through a relatively easy and quick shortening of the arc which would otherwise take place through compression only.

It appears probable that, in regions where the thrusts have been sufficient to cause well-loaded strata to form anticlines, the stresses have been great enough to cause the generation of petroleum. If these deductions are well founded, the earlier and minor stresses are connected with the production of the heavier oils, anomalous or even inexplicable as this may seem from the chemical standpoint, while the highest grade oils are usually found where the carbonization, resulting from more intense stresses, has approached the limit of oil production.

In some respects, the effects of diastrophic stresses in compressible sedimentary strata may be likened to a jigging of rock particles and mineral grains, in which process existing capillaries may become unstable and disrupted, pore spaces reorganized as to number, form and size, and friction repeatedly overcome; thus the escape, migration, concentration, and segregation of water, oil and gas, into less compressible sandstone and limestone reservoirs were promoted.

Consistent with this interpretation, it would appear that:

1. Oil will be generated only at depths sufficient to assure the necessary loading, which may vary somewhat with the composition and rigidity of the strata and, to some extent, with the intensity of the thrust.

2. In oil fields where the stress has been slight and probably confined to a single period, carbonization (alteration) being in the early stage, the oil is not likely to be found far, stratigraphically, from the carbonaceous sediments. If the thrusts have not been sufficient to drive the water, oil, and gas to a suitable storage "sand," the disseminated oil may not be recoverable. Water, with its stronger capillary tension, will tend to drive the oil into the largest pores available. Accordingly, a lenticular body of open-pored coarse sand may be filled with oil under heavy pressure, independently of anticlinal structure, or even in a shallow structural depression.

3. The largest oil pools normally occur where ample suitable storage is convenient to abundant organic mud or mother substance, unless the thrusts have been too great and carbonization has gone too far. Insufficient storage in very thin or fine-grained sands may be found in extensive carbonaceous formations; for example, the thin sands of the Graneros in the Thornton field, Wyoming, and the fine-grained sands in the Mancos shale in northwestern Colorado and in the Chattanooga shale in Barren County, Ky.

4. The stresses of a diastrophic movement may be sufficient to generate only a part of the oil and gas derivable from the organic mother sustance, leaving some to be evolved under later stresses, until oil is no longer produced, though gases may continue to be eliminated until the organic substance is wholly devolatilized, leaving only the "fixed carbon."

5. In the course of successive periods of lateral diastrophic stresses, the water, oil, and gas, under cumulative pressures, may be carried through relatively impervious rocks for long distances in the direction of least resistance, if the thrusts and consequent pressures are sufficiently energetic, capillary tension and friction being to some extent counteracted by the forces which cause rearrangement of the rock particles. For this reason, several sands may yield oil generated from a

single deposit. Enormous pressures should develop in the lower sands. In fields containing many oil sands, the oil is more likely to be of deep origin.

6. Oil pools generated and localized during one period of stress may be, and probably have been, carried on to new reservoirs, possibly at different horizons, at a later period of greater stress. This may be termed secondary migration and secondary storage. It seems within the limit of probability that some of the oil found in sands stratigraphically remote from recognizably carbonaceous beds may have come from the latter by secondary if not by primary migration.

Whether or not the geologist follows my conclusion as to carbonization, and its use as an index of incipient regional alteration, the degree of which approximately determines the limit beyond which productive oil fields will not be found, he must in any case take into account not only the alteration of the sedimentary formations, according to his own conception of the metamorphic limits, but also the thickness of sediments that, according to his judgment, are not too altered, and hence must furnish the oil. However, this subject has awakened less discussion, and therefore less systematic observation, than its very great importance demands.

It will probably be generally agreed that the requisite thickness of sedimentary strata in any oil basin depends on the character, composition, and competence of the strata; the position of the sands and the cap-rock; the distribution of the mother substance; the structure, the jointing, faulting, erosion, conditions of deposition, etc. Mother substance, reservoir sands, or cap-rock may, of course, be lacking, but for purposes of discussion, it must be assumed that they are all present and favorable, i.e., the organic matter is near but not at the bottom, and the reservoir and cap-rock are next above it. Further, a consideration of the requisite thickness must take into account the probable depth of strata eroded since the oil was generated and brought to its present storage. In other words, the original thickness at the time of deformation by horizontal stresses is to be regarded, rather than the present thickness in the producing basins, for the original thickness is what determined the amount of load on the organic beds when dynamic action occurred.

Aside from such facts as the presence of adequate organic matter, of sands suitably composed and situated for service as oil reservoirs, of cap-rock properly located, some of which have already been mentioned, a question which should not be ignored in the search for oil in a new region, such, for example, as the Tertiary fresh-water basins of eastern Washington and Oregon, or in the Great Basin region, is whether or not the beds concerned in the generation and storage of the oil are strictly of fresh-water origin, and particularly whether the oil-bearing series was laid down in an exclusively non-marine basin. Inseparably connected with this question is the related one as to the importance of the association of salt water or gypsum in the oil-producing formations, as is so insistently urged by some geologists, with citation of circumstantial evidence. On these matters opinion differs widely, possibly without succinct data sufficient for a final decision.

As criteria to be considered in the answering of this problem the following may be noted:

1. Ample organic matter undoubtedly suitable for the generation of oil and gas was deposited with the sediments in many of the fresh-water basins. These deposits contain oil shale of high quality, which, on distillation, yields oil essentially like and possibly indistinguishable from that obtained from oil shales of marine origin. Many of the organic products are common to both habitats.

2. The mechanical constitution of the deposit in both marine and fresh-water formations is essentially the same.

3. Important oil-bearing sands and organic remains were deposited during intervals, sometimes of considerable length, during which only fresh-water sediments were laid down, these deposits being intercalated in brackish water or marine sediments.

4. Oil-bearing sands and organic deposits were laid down in waters but slightly saline in the younger formations of the Appalachian trough.

5. Some salts are present in fresh-water deposits.

6. Natural gas is present in fresh-water basins, and has been developed at considerable depth in such basins.

7. While it may be true that, in the geologic processes of oil generation, salt in amounts premising marine or brackish water deposition may be essential as a catalyzer or otherwise, the fact remains to be demonstrated, possibly in the laboratory.

Rock Classification From the Oil-driller's Standpoint*

BY ARTHUR KNAPP, M. E.

THE ordinary well log is subjected to a great deal of criticism, much of which is well founded. Sometimes, though, the difficulty in interpreting the log is due to the fact that the geologist or engineer using the log does not know the limitations of the drilling method used. The rotary drill, especially, has inherent limitations that make it difficult to secure definite information at all times. The identification of well-defined key beds is about all that can be expected from the rotary log. The formation in a drilled hole, as reported by the driller, has a direct relation to the speed with which the drill makes the hole or to the reaction of the various strata on the bit, called the "feel of the bit." When this is not thoroughly understood by the geologist or engineer endeavoring to interpret the log, the result is an erroneous correlation with other wells or a discarding of the log as worthless.

Hard and Soft.—Hard and soft are relative terms. In the case of well logs, they are misleading, as they are used in connection with both resistance to abrasion and resistance to percussion. In technical rock classification, hardness is relative resistance to abrasion. The term brittleness is used in connection with resistance to blows. These terms are misleading to the geologist or engineer who is not familiar with both the cable-tool, or standard-tool, method of drilling and the rotary method. In the case of the standard tools, the driller's report of the hardness of the formation is in terms of its resistance to blows. For instance, a

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cable-tool driller might be able to make from 30 to 50 ft. a tour in a brittle limestone, which he would call soft, and at the same time he might call a relatively soft (from a purely mineralogical standpoint) gypsum hard, because it is somewhat elastic and is not readily broken by blows. The rotary driller would reverse the terms. The limestone is hard, in that it resists the abrasive action of the bit, while the gypsum might be soft, in that it is readily cut by the rotary bit. It is rare that wells drilled by the standard tools are correlated with those drilled by the rotary, but the technologist who has worked with well logs from one system might be misled when working with the other.

Sticky.—With the rotary drill, a formation is sticky which cuts in large pieces that adhere to the bit and drill pipe. A formation that is sticky with the rotary is usually sticky with the cable tools. On the other hand, formations are encountered in which the cable tools stick, either owing to the elasticity of the formation or to the fact that the drilled-up particles do not mix readily with the water in the hole and settle so quickly as to stick the bit. These formations might not appear sticky at all to the rotary driller.

Sandy.—This term may be used quite accurately by the cable-tool driller. He obtains samples of the formation through which he passes, of sufficient size to determine the relative amount of sand to clay or sand to shale in any formation. In the case of the rotary drill, this term is misleading.

Dark and Light.—This brings up the subject of color. The first question is the age of the specimen when the color is determined. A wet specimen, fresh from the hole, has an entirely different color from the same specimen dried. Specimens, when dried, bleach and deteriorate. Many of them air slack or oxidize and change composition altogether. The terms light and dark should be used only for the extremes. They are, in general, relative, and therefore indefinite and misleading.

FORMATIONS

Clay, Gumbo, Tough Gumbo.—Clay is readily recognized by the "feel of the bit" while drilling with either cable tools or rotary. To some drillers all clay is gumbo, though to others gumbo is only sticky clay. Some clays have the property of cutting in large pieces, but do not adhere excessively to the bit and drill pipe and are designated as "tough."

Sand, Packed Sand, Water Sand, Quicksand, Heaving Sand, Oil Sand, Gas Sand.—Free, uncemented sand is easily recognized by the feel of the tools in both systems of drilling. In rotary territory, we often run across the term "packed sand." This is a sand that is slightly cemented with some soft easily broken cementing material, such as calcium carbonate. It cuts, when drilled with a rotary, with much the same feeling as when cutting crayon with a knife. The cementing material is dissolved by the mud or the sand grains are all broken apart before reaching the surface, so that the driller finds only sand in the overflow. A microscopic examination of sands from the overflow often shows cementing material to be present when not suspected by the action of the bit.

Water sand is a sand containing water. There is no specific sand associated with water; any porous formation may or may not contain water. In the case of both rotary and cable tools, sand that is fresh and bright and has a clean appearance when taken from the well impresses one as being a water sand and probably does come from a wet stratum. If it so happens that the sand has been thoroughly mixed with the mud in the hole, so that each particle is colored by a film of mud, it does not appear fresh and clean and does not give the impression of being a water sand. This may be because the formation from which it came was dry or nearly so or simply because conditions were right for the quick coloring of the sand by the mud. Whether a given porous formation is a water stratum or not can only be determined by testing. It is only in rare cases that the hydrostatic pressure is sufficient to cause the thinning of the mud in a rotary hole. While drilling in a dry hole with the cable tool, it is known at once how prolific a porous stratum is.

A sand containing no cementing material nor clay very often caves badly in the hole. If this sand settles with such rapidity as to threaten to stick the tools, it is designated quicksand. Such a free sand may, on the other hand, have such properties that it seems to tend to float. It not only caves but fills the hole above its original horizon, sometimes heaving clear to the surface. This sand is called a heaving sand. The presence of gas or a high hydrostatic head often accounts for the heaving of the sand. An oil sand is a sand containing oil. There is no particular sand which is associated with oil; any porous stratum might contain oil. A porous stratum containing oil is very often called a sand, although it may actually be a limestone. A gas sand is any sand containing gas; even a hard limestone is sometimes designated as a gas sand.

Boulders and Gravel.—True boulder formations are rarely encountered in drilling for oil. They are encountered above the Trenton in Ohio and Indiana and occasionally in California. Concretions are often encountered which fall into the hole and follow the bit for some time and are reported as boulders. A green rotary driller will report boulders when he is drilling in sticky gumbo, which causes the bit to jump excessively.

Gravel is also quite rare, and as it is a question what is coarse sand and what is gravel, a report of gravel may mean coarse sand. The cable tools will bring up gravel so that it may be recognized. Loose shale or oyster shells may be reported as gravel by the rotary driller.

Shale.—Shale, to many drillers, is only that kind of true shale which appears in the overflow, or bailer, in flakes; that is, laminated shale with well-defined bedding. Other drillers include formations that are sedimentary in character and are consolidated enough to appear in the overflow, or bailer, in pieces as large as a pea or larger. They usually call a shale too hard to scratch with the finger nail, rock, particularly in rotary territory. The rotary driller finds it hard to differentiate between hard shale and soft limestone.

Rock, Gas Rock, Chalk Rock, Sand Rock, Sandstone, Shell, Shell Rock, Flinty Rock, Limestone, Lignite.—When the rotary driller strikes anything hard and does not know what it is, he puts down rock. If this hard substance is a concretion near the surface, it is a rock just the same as the most consolidated formations deeper down. The cable-tool driller has a much better general knowledge and a much better chance to get samples.

A gas rock is any rock formation containing gas; the term is applied to both sandstone and limestone.

Chalk rock is usually readily recognized by both rotary and cable-tool drillers. It is usually white or very light in color, and quickly changes the rotary mud from its usual dark gray to almost white.

Sand rock, or sandstone, is usually recognized by the rotary driller, except when it is so soft as to be classified as packed sand. The harder formations appear in the overflow in pieces sufficiently large to be readily recognized. The cable-tool driller is able to recognize sandstone and all other hard formations as he finds large fragments in the bailer.

Shell is a very misleading term. If a driller, either rotary or cable-tool, drills from a soft formation into a hard one he gives it what he considers its proper name. If, however, after drilling for a short distance, he goes back into a soft formation again, he is liable to put down shell. This shell may be from a few inches to a foot or two in thickness; it means a thin layer or shell of rock.

Shell rock means a rock formation containing fossil shells, unless the driller is careless or misunderstands the term shell, in which case he may put down shell rock, meaning a thin shell of rock.

Most cable-tool drillers are able to distinguish the characteristic fracture of flint, and their report of flint or flinty rock may usually be relied on. Flint is very seldom encountered with the rotary, and when reported in a structure in which it is not likely to be found is probably used to designate a very brittle limestone, flinty in character.

The cable-tool driller's report of limestone is usually correct, but the rotary driller does not always distinguish between hard shale and limestone.

Lignite is used to designate both the petrified and the bituminous forms of wood found in drilling. Even when the wood has not lost its fibrous character, it is often designated as lignite.

Shells.—In rare instances, solid beds of shells are encountered. They are easily recognized as such with the cable tools, but with the rotary they may not be recognized and may be reported as sand or gravel, depending on the feel of the bit while drilling. When mixed with clay or sand, shells usually appear in the log as "sand with shells" or "clay with shells."

Water Displacement in Oil And Gas Sands*

BY ROSWELL H. JOHNSON, M. S.

ALL strata not yielding oil or gas in commercial quantities or a corresponding amount of water may be called dry in a wide sense. In petroleum geology, however, we may exclude all sands of too low or fine porosity to yield gaseous or fluid contents to the hole drilled in the sand before any original pressure that its contents may be under is disturbed. Most rocks are of this class, and they are not reservoirs in our definition; their "dryness" is wholly a matter of course. What are the contents of the pores or what is the exact porosity of such rocks is of almost no concern to us, for economically they are "dry."

What does interest us is the content of a rock having sufficient porosity and the pores of sufficient size to yield oil or gas in commercial quantities, if they were present under original pressure. Dryness of these reservoirs is a matter of supreme practical importance. Three views current as to such dryness seem to me to apply in a few cases only. It is the purpose of this paper to give reasons for this position and for believing that, in ordinary sedimentary rocks, there is only rarely a reservoir of competent porosity and undisturbed pressure that is dry in the sense of not yielding water, oil or gas when first penetrated.

1. Gardner writes of some Kentucky sands, "There has never been present any salt water or any water in the sand." Absence of water cannot demonstrate this position. It is necessary to show that the rocks were not laid down in water, but in air, and that they became so enclosed, while still above the water table of the ground water, that water has not been able to enter since. Most of these sands, and certainly the productive limestones, were deposited in water; and such sands as have been commercially productive show no reason for believing that the overlying shale or limestone was not laid down progressively from one direction and in water that would have flooded it. No adequate explanation has been offered for this hypothesis, which is inherently improbable.

2. Reeves urges that "sands originally water filled may have been drained of their water and not filled when later covered." It is difficult to see how the presence of air would prevent the entrance of water where the water overlaps the sand from one side and so has ample opportunity to expel the air. However, we have an excellent test of whether the sand is dry because air filled, as proposed by Gardner, by merely analyzing this supposed entrapped air. Instead of the air called for by Reeves' hypothesis we nearly always find methane. There are very rare occasions where it is mainly nitrogen, probably entrapped air denuded of its oxygen by the oxidizing of materials in contact. For these occasions, as at Dexter, Reeves' hypothesis is helpful; but its unimportance is measured by the extreme rarity of such cases.

3. Shaw holds that a sand may be adequately porous and hold water and yet not yield it to a drill hole because of lack of expansive force behind it. In view of almost universal rule of an increase of pressure with depth in our ordinary sedimentary strata, such as we find in oil fields, such a failure must be very rare.

An absence of methane would not be expected in the sedimentary series in which our oil and gas fields are found, because these rocks are so generally charged with some gas, either free or dissolved in oil, in some part of the reservoir. Even with no methane, we know that propane and butane are soluble in water to an extent of nearly 3 per cent, so that they could give it expansibility for at least a short time.

Concluding, then, that the reservoirs now containing oil and gas originally were water filled and that the gas and oil later entered the reservoir, thereby displacing water, it becomes a matter of interest to postulate the resulting movement of the oil, gas, and water, respectively. We may assume that the oil and gas enter on all sides of the reservoir. If at the bottom they would

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rise to the top, although in all probability generally deflected en route along some bedding plane. Having reached the roof of the reservoir, since this is ordinarily elongated and pitching, they would move along the inclined plane until they formed an oil and gas accumulation at the upper end.

The matter of special interest to us is the action as it finds minor dome-like irregularities. These will necessarily be filled if there is enough oil and gas to fill them. If more than enough oil and gas reach these local catchments, the oil and gas will resume their movement up dip. However, as this movement continues, the proportion of the gas in these catchments will increase. Indeed, the oil may nearly all be forced down into the general stream and so move on up to the highest oil and gas mass. In this motion upward along the crest of the reservoir, the path would not be a broad one. Any "bulge" in the roof to one side of such a "path" would not be fed with oil and gas, except such as was caught by direct upward movement to it by side paths flowing on the way to the ridge. If the crest of the reservoir was very flat and broad we might possibly have a series of braided paths, such as one finds in some rivers of broad bed. In the top mass of oil and gas to which the paths lead, the percentage of oil to gas should be higher than any bulge below, because of the excessive proportion of gas held below. This selective action explains some of the differences in relative percentage of gas and oil in different pools. Suppose, now, the reservoir as a whole is arched; each flank is then working as before suggested, but the oil-gas mass is held at the crest instead of by the termination of the reservoir.

So far as the upward motion of the oil and gas has been discussed, we have assumed that there are no obstacles to the free motion of any molecule of oil and gas, as directed by gravitation. However, one serious obstacle, surface tension, leads to the oil or gas rounding off into a bubble, which thereby offers great resistance to motion in sandstone as fine as we generally find it. A bubble forms in each "chink" between grains, but its oil cannot move until the bubble grows so large as to extend as a bud through one of the larger passageways into the adjoining chink between grains. Only a continuous invasion can make progress. It is a mistake to think of a passage of a series of bubbles as such. The resistance in that case would be so great that gravitation at least would be impotent except with very coarse deposits.

The water must have a motion away from the upper part of the reservoir, as the movement of the oil and gas upward along the roof drives the water, in part, back into the shale and, in part, down the reservoir to the lower end. Again, we must consider the effect of depressions in the floor (whether depositional or deformational) on the water as it recedes to the lower end of the reservoirs. The water would fill each depression and spill over its oil in the general movement down the reservoir. It retains a disproportionate share of water after all the oil and water have passed this depression going down dip. Some of the water may be forced out through the floor of the reservoir, but it would usually leave the water in excess until the gas accumulation was quite large. Therefore we conclude that the depressions are less favorable points for oil and that most of the oil will accumulate at the lowest part of the reservoir. The lowest part of the reservoir being so frequently a matter of lateral variation or "tailing" of the bed, this place is more difficult to locate. Hence the search for oil in sands without water is more difficult than in those carrying much water. It is not a case of mere reversal, seeking anticlines in one case and synclines in the other. Structure is, then, of still less help in the waterless sands than would otherwise quite naturally be supposed.

Drilling and Production Technique in the Baku Oil Fields*

By Arthur Knapp, M.E.

NO OIL territory in the world has been so rich in large producing wells, in a comparatively small area, as the Baku field. Particularly is this true of the Bibi Eibat field, which formerly produced millions of "poods" of "gusher," or as it is called in Russia, "fountain" oil. The Bibi Eibat and Balachany fields have been exhausted of gas and ruined by water, but the Surachany and Benegadi fields are still fountain territories, and many outlying districts that have only been prospected produce rich fountains.

The method of controlling fountains, or gushers, is the result of growth, along with the Russian system of drilling, where large diameters and riveted casing have been in vogue. The screw casing is seldom used except to exclude water. Formerly the method of finishing wells and the condition of the casing at the top of the well would not permit the use of gates, manifolds, and connections, as is standard elsewhere.

The life of flowing wells is very short, particularly those 10 in. or more in diameter, which produce large quantities of sand and often flow for but a few days and are then a complete loss. More than 1,000,000 poods in twenty-four hours have been claimed in several instances, but in no case was the flow for more than a few days.

The oil sands of this district are free uncemented sands and vary in thickness from paper thin to a maximum of 10 ft. The sands are interlaid with strata of soft clay. In spite of this, the practice has been to drill into such sands and produce from the open hole without screen or liners. Sometimes the casing is set below the oil sand, but in this case holes from 2½ to 3 in. in diameter are drilled opposite the oil sand, which would not have the effect of a screen.

Valves, tees, and lead lines are sometimes put on the well to prevent its flowing before a shield is complete and to control the well in case of fire. No attempt is made to control the production or to direct the flow when the well is put to producing; the well is always

*Abstract of a paper presented at the February, 1920, meeting in New York of the American Institute of Mining and Metallurgical Engineers.

allowed to flow to capacity. Usually the valves are cut out and rendered useless soon after the flow commences. The wear of the blocks depends on the flow; sometimes they must be renewed daily. This arrangement of fountain control is primitive and wasteful and moreover is not always effective.

The Russian riveted casing is far from water-tight, which accounts for the large amount of cement put in around the casing. Sometimes it is necessary to fill the casing with clay before the liquid cement will remain behind the casing long enough to set. The cement is put in with pumps, 1 or 1½-in. pipes being inserted between the casings to convey it to its place.

The Russian method of drilling makes use of steel poles to actuate the tools, but differs from the Canadian system, which also uses poles of wood or iron, in that a "free-fall" is used above the tools instead of the tools dropping with the rods. This free-fall picks up the tools at the bottom of the stroke and releases them at the top of the stroke, allowing them to fall free to the bottom of the hole. Thus the fall is limited to length of the stroke of the walking beam and differs from the American cable-tool system, where the fall, due to the elasticity of the drilling cable, may be several times the stroke of the beam.

The Russian drilling machine is a slow ponderous machine, heavy and very hard to handle, transport, and install. It cannot be said in reality that this machine drills; it manages to worry a hole in the ground. The results, as shown in the tables, prove this. The large starting diameters are necessary because of the large number of strings of casing used and the large oil string necessary for producing by bailing. Also, there are several producing horizons, and wells are drilled large into the first horizon, so that later they may be deepened. Casing, both Russian riveted and screwed, is lowered by means of clamps somewhat on the style of the American casing clamp. The Russians have never developed nor learned to use elevators, spiders and slips, casing tongs, or other modern oil-well tools, except when these tools have been brought in with American machinery and used by the American drillers. The casing is always carried with the tools in the Russian system. The bit is seldom advanced more than 20 ft. beyond the shoe. Under-reaming is practiced to a large extent.

Appraisal of Oil Properties*

By EARL OLIVER

THE term oil property, in this discussion, includes any type of easement or grant under which petroleum might be produced; it ranges from the mere right to drill on undeveloped wildcat acreage up to a fully developed oil property. The values of an oil property, as thus defined, vary widely according to the use for which it is intended, whether it is from the viewpoint of the speculator, the fraudulent stock promoter, the refiner and pipe-line owner, or the oil producer.

Speculation, particularly lease speculation, is a parasitic growth on the oil industry, healthy enough, but of no economic value. The class of property usually dealt in for this purpose is the undeveloped lease. Its speculative value may have some relation to its probable productive value, but most frequently this value is the product of temporary excitement due to local development. The lease speculator, seeking out the trend of development or securing early information regarding a proposed test or a new discovery, immediately secures leases whose market value will be increased when the existence of such development becomes more widely known. His profits are purely unearned increment. Not proposing to spend money in exploration, he can afford to compete in purchase with the operator, who, in addition to bonus paid, must spend large sums in testing out his own acreage and that of the nearby speculator as well. It has a tendency to compel unduly high bonuses. The so-called "checker-board" system of leasing wildcat acreage by the larger companies is on the same principle of attempting to secure the benefit of money expended by others in testing, but most of them remove the obnoxious holdup feature by contributing toward such testing by others in proportion to the benefit they themselves secure.

Fraudulent stock promotion, as contrasted with lease speculation, is an unhealthy disreputable growth and justifies mention only that attention may be called to the burden it places upon the oil industry. The value of an oil property for this purpose has no real relation to its productive value, the property being selected for its adaptability to a fantastic tale of fabulous earnings to draw money from people with small savings. Consequently, the promoter pays for leases suitable to his purpose prices entirely out of proportion to their probable economic value. Such prices, however, immediately influence owners of surrounding unleased areas when dealing with the legitimate operator.

The lease speculator and fraudulent-stock promoter, though entirely dissimilar in their standards of ethics and respectability, have, therefore, this in common—they tend to place on prospective oil-producing areas, before these get into the hands of the oil operator, values that have little relation to their economic worth. The impossibility of determining the exact economic value, the knowledge that other men are paying like prices, and the optimistic spirit of the operator generally lead him to meet these fictitious values and pay prices for undeveloped leases, especially in the vicinity of a new discovery, entirely out of proportion to their chances of being profitably productive.

The value of an oil property to a producer as such (stripped of its speculative feature) is simple in principle and is nothing more nor less than the present worth of the aggregate margin of profit between the expenditures for producing, saving and disposing of the oil in its crude state and the price received for the same. To ascertain such value is a simple matter in accounting—of balancing expenditures against receipts and introducing interest charges. It differs little from the average bookkeeper's problems except that it is reversed. The bookkeeper balances expenditures against receipts on business that is past; the oil-property appraiser balances expenditures against receipts on

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business of the future. To his bookkeeping ability he must, therefore, add the ability to see into the future—and underground as well.

His principal difficulties are to determine the number of barrels of oil the particular property will produce and the price per barrel he will receive. He has several other factors to consider, such as the cost of developing, and of maintenance and operating, but these are easily disposed of if he is able to accurately forecast the first two named.

The scientific theorist and the experienced oil producer represent the two types of appraisers that have been known to the oil industry for many years. The difference between them might be better understood by stating that the early petroleum engineer, in purchasing a race horse, would have investigated carefully the history of the dam and sire for several generations back, ascertained what food and treatment the dam had prior to the foaling, would have given a hasty glance at the horse itself and concluded, that in view of the record of its progenitors and the early influence brought to bear upon it, it should be able to do a mile in two minutes flat, and, accordingly, purchased it on that basis. Whereas, the producer, purchasing the same horse, would send it around the track, time it, and buy it on the speed shown, in ignorance of inherited and pre-natal influences.

There is now being evolved a new type of petroleum engineer. He knows the theories of the scientist, but he demands that they shall be measured up with actual results. He knows what percentage of structures in a given locality have been found productive or barren upon being tested. He knows, from compiled data, where oil accumulates. He calculates oil content per acre by counting barrels actually produced from similar areas already exhausted. He measures the numerous scientific theories with actual results. His business is the collection of complete data from innumerable properties so that he may know the habits of petroleum, instead of assuming for it certain habits in keeping with his ideas of what they should be. This new type of petroleum engineer is expected to develop methods of determining the probable productiveness of certain areas with much greater accuracy than the methods now available will permit. However, until such methods and data are available, it is necessary to use the older general principles.

For appraising, the property may first be divided into developed and undeveloped portions. The developed portion is then subdivided into "settled" and "flush" productions, provided the old and new wells are not so intermingled as to make this impracticable. For both classes it is desirable to have production figures extending back month by month to the completion of the wells. Should these figures not be available, they should at least run back one or two years, if the wells are old enough. There will, of course, in so far as it is available, be a complete history of each well and full data regarding it.

One purpose is to ascertain whether the composite production is made up of comparatively uniform wells, and whether the production figures as shown month by month represent the regular and natural rate of decline, or whether some unusual condition might have changed the past production from the natural rate. Should there be such condition, its influence is given such consideration as it appears to warrant, and it is eliminated, if possible, from the figures.

On the "settled" production figures, a curve is then constructed covering the entire past life of the property in so far as such figures are available. While properties of the same age differ greatly in their rates of decline, each property, throughout its entire history, is characterized by the same rate of decline; i.e., if during the first part of its history it shows a rapid rate as compared with other properties of like production per well and age, it will have a rapid rate up to the point of exhaustion. After the flush production is off, provided the wells are not unusually large, the rate of decline is so uniform as to make possible, for all practical purposes, the use of some definite percentage each year from the previous year.

For the appraisal of individual settled properties, where something more reliable than mere generalties is desired, a general production curve should not be used; instead the curve of the property itself should be projected.

Every producing property is a type unto itself and where reliable appraisal is desired no property can be thrown into any general class at so much per barrel. Each property has characteristics that place it above or below the average, and as stated on settled production, located apart from new wells, it is desirable that its own production curve be projected.

With flush production, however, this cannot be done, since there will not have elapsed sufficient time to indicate a rate of decline. Reliance upon general decline curves cannot be avoided, but care should be taken to select a curve compiled from properties as similar in type as it is possible to secure. As a check, data compiled from similar properties as to yield per acre-foot is helpful for "flush production," although of too general nature to be of assistance in appraising "settled" production. Briefly, therefore, for "settled" production the curve of the property examined should be projected, while for "flush" production the use of a general decline curve compiled from similar properties is permissible.

The undeveloped portion of a property should be viewed from an entirely different angle. This will range from so-called rank "wildcat" acreage up to that which is sufficiently surrounded by production to be substantially proved. It is rare, however, that any undrilled acreage will be so thoroughly proved as to jusify a method of appraisal that will include assumption of a certain number of locations with an assumed initial production per well and with application thereto of a decline curve. Theoretically such method appears satisfactory, but it does not work out well in practice. However conservative the appraiser attempts to be, such method of appraising generally leads to overvaluation. It is poor practice. Such a method starts with the assumption that the undrilled acreage will be productive and then attempts to call to mind all factors of uncertainty for which discount should be made, but some of these will be missed and the property be thereby given a higher rating as to certainty of production than, as a rule, it justifies.

The basic assumption on undrilled acreage should be the reverse of the above; *i.e.*, that it is barren, and then such factors should be assembled as will tend to take it out of that class. Perhaps this distinction has not been made clear and it has reference only to the state of mind of the appraiser toward the property, but this tendency toward optimism regarding the probable productiveness of acreage has caused much more money

to be spent in the attempt to produce oil than the industry has paid back in the aggregate to the producer. By the very nature of the industry there must be great individual gains and losses, but the industry as a whole should pay its own way; and the fact that it does not in the aggregate do so should be more widely recognized and values adjusted accordingly.

It is in this field of undeveloped acreage that the work of the petroleum engineer is in most need of extension. Comprehensive data showing the percentage of seemingly favorable structure that has proved profitably productive, the conformity of subsurface to surface structure in given districts, the percentage of production seemingly off structure, the persistence of sands, the yield per acre-foot, and thorough study of the accumulation of oil as it is actually found to exist rather than a preconceived theory of how it should accumulate, together with a more widely spread knowledge of the results, will be helpful to the industry and place undeveloped acreage on a proper footing. Such factors together with many others must be taken into consideration by him who would appraise undeveloped acreage with any degree of safety. This investigation must, however, be made with the cold calculating analysis of the engineer—who looks only at facts, rather than by the scientist whose province it is to explore farther afield.

A factor in the appraisal of oil properties of almost equal importance to the amount of oil secured is the price to be received for the oil. Regardless of the views sometimes asserted, the market price of crude oil and the usual fluctuations are influenced by the law of supply and demand.

Having determined upon extent and rate of production that might reasonably be expected from a property and the probable trend of the market price, there then enter the cost of development and maintenance and the consideration that should be given the possibility of increasing the amount of oil to be produced by the application of different methods. This, again, is an uncertain field, and if the property is fully drilled such possibility frequently no more than offsets the dangers unseen. The equipment that is needed for the permanent operation of the property should be given no credit unless the property is relatively near the point of abandonment.

A tabular analysis of factors influencing valuation of oil property concludes the paper.

Variation in Decline Curves of Various Oil Pools*

BY ROSWELL H. JOHNSON, M.S.

THE "Manual of the Oil and Gas Industry," under the Revenue Act of 1918, published by the Treasury Department for the guidance of oil companies in preparing their estimates of future recoverable oil for the purpose of calculating depletion, gives the first large public collection of comparative decline curves for the whole country. It is a matter of both scientific and practical interest to so arrange these data that the pools can be readily compared. There are certain difficulties in such a comparison: (1) The economic limit varies from 50 to 2,000 bbl. a year in different pools taken. (2) Because of this variation in economic limit, the range of data shown makes comparison possible only for wells of intermediate size.

In general, the amount of oil, in barrels, produced while a well declined from 3,000 bbl. to 2,000 bbl. a year is shown in Table I.

TABLE I. PRODUCTION OF WELLS DURING DECLINE FROM 3,000 TO 2,000 BARRELS A YEAR

Field	Minimum Barrels	Median Barrels	Mean Barrels	Maximum Barrels
California	2,500	5,800	6,260	10,200
Gulf Coast (Saratoga only)	2,160	....	3,930	5,700
South Mid-continent	1,700	2,700	2,666	3,600
Gulf Cretaceous	1,000	1,500	2,175	5,600
Mid-continent	600	1,350	1,785	3,400
Rocky Mountains	700	1,310	3,170	7,500
Appalachian	450	1,225	1,489	2,750
Illinois	410	1,288	1,285	2,200

In order to be as inclusive as possible, I have taken as an expression of the rate of decline the amount of oil produced in the period during which a well drops from 3,000 to 2,000 bbl. a year. No period of smaller production could be used because of the high economic limit in California; and no period of larger production and yet include the small well areas of the Appalachian. As it is, the Lima-Indiana wells are excluded. In a few instances, curves were extrapolated to obtain the reading, where the curve seemed regular enough to warrant it.

In addition to the foregoing table, the author presents detailed tables from the important oil fields of the United States as well as for certain separate pools and then concludes by saying that caution must be used in avoiding conclusions based on differences not clearly in excess of probable error, yet the following conclusions seem to be warranted from the differences, which are large and consistent:

1. The widespread impression of the much greater persistence of the California field is fully borne out in general, yet a considerable variation is shown.

2. The great importance of the thickness of pay is well borne out by the great contrast, in Wyoming, between Salt Creek on the one hand and Grass Creek and Elk Basin on the other.

3. The Gulf Cretaceous shows a great contrast between the persistent Corsicana and much less persistent northern Louisiana fields.

4. The South Mid-continent field shows an excellent persistence at Electra, Burkburnett, and Heraldton. The more recent close drilling in Burkburnett and the inclusion of the Ranger, Desdemona and Caddo, Texas, pools will cause this field to show less favorably in the future.

5. The three fields of oldest geological age all show poor persistence. The hypothesis that this is characteristic of fields older than Devonian is proposed. This should be expected theoretically, as there should be an increased cementation in older beds, so that the low pressures in old wells become impotent to expel oil. The fields in question are the Lima-Indiana of Ordovician age and the Clinton and Hoing sands (Plymouth pool) of Silurian age.

*Abstract of a paper presented at the February, 1920, New York meeting of the American Institute of Mining Metallurgical Engineers.

6. The poor showing of the Appalachian fields, which are relatively younger (Dorseyville and Shinnston), is probably due to the method employed, which bases the future history of all wells on the performance of the small wells in the early history of the pool. These small wells, having in general a thinner pay, have a more rapid decline than the typical wells after they have reached the same size.

7. The most interesting result is that the Appalachian is apparently not more persistent than the Mid-Continent, as had been supposed, when wells of the same size are compared. The long life of the Appalachian wells is mainly the result of the lower economical limit. The Mid-Continent wells will show a longer life as the price in that field rises and so puts down the "economic limit" of the wells. This consideration is a favorable one in the appraisal of Mid-Continent properties.

8. There is a great variation from pool to pool within the field. It follows that the attempt to appraise a property by applying to it the barrel-day price of a property in some other pool or sand, or an average from many pools or sands, is unwarranted where the data permits an analytical appraisal.

9. Since the rate of decline is not constant, the barrel-day price unit changes during the life of a property; therefore barrel-day prices are not comparable except for properties of similar age and size as well as the same pool.

Institute Sessions on Oil and Gas

New York Meeting of the American Institute of Mining and Metallurgy Brings Out Interesting Papers Covering a Wide Range of Subjects Technically And Commercially Important

THE oil and gas sessions of the New York meeting of the Institute on Feb. 16, 1920, were called to order by Everette W. De Golyer, who presided at both the morning and afternoon sessions. Ralph Arnold, who was to have presided at the afternoon session, sent word that he was stalled in Buffalo on account of frozen rails. Everyone who had bucked the cold wind in New York appreciated Mr. Arnold's situation.

The first four papers of the morning session were read in abstract in the absence of the authors. The first, "Oil Fields of Persia," by Campbell M. Hunter, in view of the importance of foreign oil-field development, gave an interesting description of conditions and the status of development in that country. The second, "Rise and Decline in Production of Petroleum in Ohio and Indiana," by J. A. Bownocker, State Geologist and professor of geology, Ohio State University, was an historical résumé of activities in Ohio and Indiana petroleum areas, which reached their maximum production between the years 1890 and 1905. The Lima-Indiana field was opened thirty-four years ago. In 1917, 534 wells, of which 174 were producers, were drilled in Ohio, and 266, of which 174 were producers, were completed in Indiana. The magnitude of the drilling is indicated by the fact that from June, 1905, to Dec. 31, 1917, 12,514 wells were sunk in the Ohio part of the field and 13,005 on the Indiana side. Barrett estimates that 30,000 wells have been drilled to the Trenton in Indiana, and the number in Ohio must have been larger, because the producing area is much greater. The paper reviews the different areas which have been productive.

The third paper, "Petroleum Resources of Kansas," by Raymond C. Moore, State Geologist of Kansas, gives a brief historical account as well as a description of stratigraphy, technology and production statistics. The author concludes with the statement that, at present writing, the rich Butler County fields are past the zenith of their production, but the discovery of new fields, east of Elbing and extending toward Peabody, in Marion County, has given new impetus to development in that part of Kansas. In summary, the Kansas oil fields are, in all probability, beyond the peak of their production. Much of central and western Kansas may yet be tested, but conditions are difficult or impossible to predict, and the result cannot be foreseen.

The fourth paper, "Rule of Bed-Rock in the Distribution of the Hydrocarbons," by Maximo Macambyra Monte-Flores, E. M., Bahia, Brazil, calls attention to anomolous recurrences of oil in relation to structure and suggests, under certain conditions, synclinal and flat structures may contain oil deposits.

Roswell H. Johnson gave a brief abstract of his paper, "Water Displacement in Oil and Gas Sands." (See abstract, p. 516.) Sidney Page asked Mr. Johnson to explain the diagram drawn to indicate the readjustment of gas, oil and water in underground structure. Mr. Johnson stated that the position of the oil in relation to the gas and water was the final resultant of equilibrium conditions. David White said that there was probably no oil sand which had not at some time been saturated with water. The expulsion of water under varying conditions is much discussed, and, he said, is fairly well understood. The reason that oil does not flow from a sand is because of the fact that former pressures have been reduced and equilibrium is established. Absence of flow predicts relaxation of pressure and development of tension. Mr. White raised the question as to whether deformation of structure occurs while oil and gas are in process of migration. Dr. H. H. Ashley and others joined in the discussion, which chiefly developed interest in the subject of water displacement, but did not reach definite conclusions.

In the afternoon I. N. Knapp presented, in abstract, Arthur Knapp's paper on "Drilling and Production Technique in the Baku Oil Fields" (see abstract, p. 517). Mr. I. N. Knapp presented a written discussion of the paper. He said that though it was true that, after oil was encountered, the wells were allowed to flow freely until exhausted, Noble Brothers over thirty years ago capped their wells and conserved the flow. In the mean time they purchased oil from neighboring wells until they found that they were buying their own oil. Mr. Knapp made the witty suggestion that in view of the enormous gas and oil waste in the Baku field, it would be an excellent place to send our own oil and gas conservationists. They would there find excellent opportunity for their efforts.

Mr. Knapp also compared oil-well operations in

Baku with operations in our own fields, and showed that inordinate time was consumed in relatively simple casing and drilling operations. Through personal correspondence with the author, Mr. Knapp was able to give interesting details of the difficulties of an American engineer in the employ of Russian companies. It took Arthur Knapp six months to learn enough of the oil-fields Russian to give his orders over the telephone.

"Rock Classification From the Oil-Driller's Standpoint," by Arthur Knapp (see abstract, p. 514) was presented in abstract by I. N. Knapp. L. C. Glenn, professor of geology, Vanderbilt University, next presented his paper on the "Oil Fields of Kentucky and Tennessee." The paper reviews history, geology, structure and technology. Mortimer A. Sears and Stewart St. Clair contributed written discussions. W. D. Smith's paper on "Petroleum in the Philippines" was read, in abstract, by one of the members present. David White said that it was appropriate and timely to bring this subject before the Institute, as the oil industry in the Philippines is open to American enterprise, while much of the oil land in countries surrounding the Philippines is closed to us. In view of the development of American shipping, there is a strategic advantage of oil supplies in the Philippines.

Roswell H. Johnson presented, in abstract, the joint paper by Stirling Huntley and himself on "A Résumé of the Pennsylvania-New York Oil Field." Mr. Johnson commented particularly on the McKeesport, Pa., gas exploitation: The Foster-Brendel No. 1 well had an extraordinarily high initial flow, and unusually favorable marketing conditions enabled it to yield over 50,000,000 cu.ft. the first day it was controlled, which was a week after its completion. Lithology here seems to play a more important part than structure. Dry holes, drilled along the axis of the structure, revealed a dry tightly cemented sand, which, until recently, condemned the structure. The lateral limits of large production seem to be fairly well established; and, due to the small area and the close spacing of the wells, it is expected that the pool will have a short life. The rock pressure has already lowered from 1,600 lb. to 350 lb., and is declining at more than six pounds per day. The excitement over the one really large well has led to unjustifiable claims that this is one of the world's largest gas field; it has also led to an orgy of promotion and speculation. Except the Foster-Brendel lease, the pool will show a net loss to the producers. Dr. Ashley and David White contributed to the brief discussion.

The last paper of the series, "Petroleum in the Argentine Republic," by Stanley C. Herold, was read, in abstract, by L. G. Donnelley. Chairman De Golyer said that at present production of petroleum is in the hands of the Argentine government. The discovery came about through drilling for water. It is not known whether the production of oil by the government is profitable, but an exclusive policy seems to have been developed. Mr. De Golyer pointed out that it is a peculiar situation for a country without fuel to adopt a policy detrimental to oil development.

The session on Feb. 17 opened with Ralph Arnold in the chair. The members gathered slowly, but before the end of the morning there were about one hundred present. George Otis Smith, Director of the U. S. Geological Survey, presented his paper on "A Foreign Oil Supply for the United States." Mr. Smith's paper touched upon the pressing necessity for intelligent preparation to forestall the constantly increasing draft upon our domestic resources of petroleum. His main conclusions will be found on the editorial page of this section (p. 509). M. L. Requa sent a written discussion of Mr. Smith's paper, in which he called attention to this, our most critical raw-material problem. We are utterly without a foreign policy, he said. The situation has been repeatedly discussed, and the Director of the Geological Survey has for the last five years been urging consideration of this subject.

Chester W. Washburn also sent a written discussion in which he suggested the wisdom of American companies co-operating and pooling their interests in the case of exploitation of foreign fields. He cited the case of the examination and engineers' report by four separate geologists on a certain Venezuelan oil property, which was worthless. He pointed out how co-operation would operate to prevent different companies attempting to outbid each other to an excessive extent in acquiring options.

C. A. Fisher contributed to the discussion by pointing out the need of encouragement to the oil prospector as well as to the American business man who is opening up new fields, and emphasized our own shortcomings in both respects. David White then showed that, after all, the policy of the conservationists had accomplished something in reducing waste. Director Smith explained further that the Government policy of withdrawing from entry oil land areas was initiated at a time when there was excessive waste, that such action was justifiable, but that now we need much more oil, and so must encourage production.

In the absence of A. C. Veatch, W. C. Phalen presented the abstract of Mr. Veatch's paper on "Petroleum Resources of Great Britain." A written discussion was contributed by Chester W. Washburn and read by E. L. Miller. Mr. Arnold voiced the feeling of the members present when he said that we all as Americans took pride in Mr. Veatch's work in England.

David White discussed his paper "Genetic Problems Affecting the Search for New Oil Regions." By vote of the members present Mr. White was permitted to extend his time. Considerable interest was taken in this paper (see abstract p. 512). E. W. Shaw in his brief discussion brought out the dynamo-chemical action involved in the genesis of petroleum. R. H. Johnson did not agree with Mr. White's ideas as to the probable occurrence of petroleum in fresh-water sedimentaries, and said that, while he believed in the fresh-water origin of natural gas, he was disinclined to agree with Mr. White's position until field evidence showed more examples of petroleum deposits associated with fresh-water formations.

H. W. Hixon threw a broadside into the discussion by calling into question the organic theory of the genesis of petroleum. He advocated the inorganic theory of the origin of oil and pointed out that petroleum occurred beneath coal beds. David B. Reger, in reply, pointed out a specific instance of where oil had been won from geological horizons intercalated with coal seams. Other members seemed reluctant to take up the gage of battle thrown down by Mr. Hixon, and the chairman called for Bailey Willis' paper on "Geologic Distillation of Petroleum." The abstract of this paper was read by David B. Reger, who also discussed it. E. C. Shaw was on his feet as soon as Mr. Reger concluded, and stated that the paper seemed to him like interesting fiction

related here and there to historical fact. Mr. Shaw then expressed the belief that the conditions influencing changes in composition are due to differential pressure, which has a far greater possibility for producing chemical changes than direct uniform pressure. Dr. White and Mr. Hixon concluded the discussion of Professor Willis' paper.

At the afternoon session the following papers were presented in abstract: "Variation in Decline Curves of Various Oil Pools," by Roswell H. Johnson; "Apprasial of Oil Properties," by Earl Oliver; "International Aspects of the Petroleum Industry," by Van. H. Manning; "The Composition of Petroleum and Its Relation to Industrial Use," by C. F. Mabery; "Geology of Cement Oil Fields," by F. G. Clapp.

The first three papers are given in abstract on pages 520, 518 and 510, respectively.

Personnel of Special Committee to Investigate Natural Gas Problems Announced

Secretary Lane of the Department of the Interior announces that the following appointments have been made for the committee of ten, authorized by a resolution at the Natural Gas Conference, held under Secretary Lane's invitation, at Washington, Jan. 15, 1920:

Van. H. Manning, Director, Bureau of Mines, chairman; John B. Corrin, the Reserve Gas Co., Pittsburgh, Pa.; L. B. Denning, the Ohio Fuel Co., Pittsburgh, Pa.; J. C. McDowell, Wichita Natural Gas Co., Pittsburgh, Pa.; W. L. McCloy, the Philadelphia Co., Pittsburgh, Pa.; John S. Rilling, Public Service Commission of Pennsylvania, Harrisburg, Pa.; Miss Edna N. White, American Home Economics Association, Detroit, Mich.; Art. L. Walker, chairman, Corporation Committee, Oklahoma City, Okla.; F. W. Wozencraft, Mayor, Dallas, Tex.; Samuel S. Wyer, consulting natural-gas engineer, Columbus, Ohio, and Dr. I. C. White, State Geologist of West Virginia, Morgantown, W. Va.

The functions of this committee will be to consider the wastes now going on in natural gas and the relations between the natural-gas companies and the consuming public. The committee has been carefully selected from a number of nominations with a view to representing equally the interests of the public and the natural-gas companies. The broad questions of the relations between the consuming public and the gas companies will be considered, so that a program may be drawn up looking forward to the application of those engineering principles which it is known minimize the waste of natural gas now taking place and prolong the supply of gas to the consumer.

Oil in Western Canada.—Many areas in Alberta, Saskatchewan, and Manitoba give promise of being petroliferous, but no large commercial fields have yet been found, and production has been confined to a few thousand barrels annually from the Calgary field. Many will remember the 1914 boom in Alberta, when hordes of stock-selling and hopeless drilling schemes sprang up like mushrooms. The Canadian government has issued a 90-page pamphlet, in which the geology of the more promising districts of Western Canada is discussed, with maps, and the drillers' logs of 52 wells in widely separated districts, are given. Those interested may have a copy free of charge by addressing the Department of Mines, Ottawa, and requesting Memoir 116, "Investigations in the Gas and Oil Fields of Alberta, Saskatchewan and Manitoba."

Incomplete Retorting of Oil Shales Suggested

Experiments Show That 80 Per Cent of the Oil Is Given Off in Half the Time Necessary for Complete Extraction

BY G. R. DE BEQUE
Denver, Colorado

NUMEROUS retorting tests made on Colorado oil shale show that up to a certain stage of the treatment the oil is extracted with comparative rapidity. A test was recently made by Dr. David T. Day, using a charge of 9 lb. of shale of average grade, yielding 45 gal. per ton by complete retorting. The charge was retorted for 90 min., and a measurement of the oil was made every 15 min. during the operation. The quantity of oil produced was as follows:

At the end of 15 minutes	135 cc.,	17.7 per cent,	or 7.96 gallons per ton
At the end of 30 minutes	365 cc.,	48.0 per cent,	or 21.60 gallons per ton
At the end of 45 minutes	605 cc.,	79.6 per cent,	or 35.82 gallons per ton
At the end of 60 minutes	685 cc.,	90.1 per cent,	or 40.54 gallons per ton
At the end of 75 minutes	695 cc.,	91.4 per cent,	or 41.13 gallons per ton
At the end of 90 minutes	760 cc.,	100.0 per cent,	of 45 gallons per ton

From the above figures it is evident that the oil was produced rapidly up to the end of 45 min. and thereafter flowed more slowly.

In Scotland the oil shale is subjected to complete distillation. The treatment requires from three to four hours at a maximum temperature of about 1,700 deg. F. It is probable that in the Scotch practice the oil is the principal product and the ammonia liquor is a byproduct up to a certain point in the treatment, and beyond that point the ammonia liquor becomes the principal object and the oil produced during that stage becomes of secondary importance.

During the first few years of the oil-shale industry in Colorado and Utah the production of oil will be of prime importance, and the ammonium sulphate and other chemicals will probably constitute the byproducts. The majority of operators intend to subject the shale to complete distillation, but the advisability of such procedure during the first years of the industry in the United States is questionable. The principal object will be the production of the more common grades of oils, and the various byproducts should be left for future consideration.

That the oil production can be materially increased and the cost greatly reduced by shortening the time of retorting is evident from the test made by Dr. Day. For example, a plant that is designed to treat 1,000 tons of shale containing 45 gal. of oil per ton, by complete retorting would produce 45,000 gal. of crude oil per day. This oil would yield gasoline, kerosene, lubricating oil, paraffine wax, and asphaltum residue. Drugs and chemicals would be extracted from the asphaltum residue, and ammonium sulphate would be an important product. If the shale were treated only one-half of the time necessary for the complete recovery of the oil, the capacity of the plant would be increased to 2,000 tons per day. Instead of yielding 45 gal. of oil per ton, the extraction would be 35.8 gal., but the total output of the plant would be 71,640 gal. of oil per day, as compared with 45,000 gal. if the shale were subjected to the full time of treatment. A considerable quantity of ammonia liquor would be produced as a byproduct, but the waxes and the heavier oils and tars containing the valuable drug and chemical products remain in the residue.

ITEMS FROM THE OIL FIELDS

Americans Acquire Four Million Acres of Oil Lands

Report Reaching Washington States That Some Promising Fields of Central and South America Will Be Developed

Great Britain's boast that she would soon control the petroleum industry of the world, and especially in Central and South American fields, will receive a severe setback if a report reaching officials in Washington proves to be correct. A group of powerful American financiers, according to the report, have procured the oil rights to more than four million acres of the most promising oil fields in Central and South America, including Peru, Chile, Honduras and other American republics. A corporation to develop these properties is about to be formed.

E. Mackay Edgar, head of the firm of Sperling & Co., London bankers, recently made the statement that England would wrest control of the petroleum industry from America and pointed out that at the present rate of consumption, especially of high grade products, America in ten years would be importing 500,000,000 bbl. of oil yearly. He predicted that the annual cost of oil would be more than a billion dollars, nearly all of which money would find its way into British pockets.

Activity in Liberty Co., Texas

In Liberty County, the Hull field produced 6,000 bbl. of oil daily during the first week of February. Four wells now drilling in this field are being watched with interest; the No. 1 Barngrover well of the Empire Gas & Fuel Co.; the No. 1 Guedry of the Humble Oil & Refining Co.; the No. 1 well of the Yount-Lee Oil Co., and the No. 1 Harrison of the Monarch Oil & Refining Co. The first three have all had blowouts of gas and a little oil from below 2,000 ft. in depth. The Sun Co. completed one well recently in this field, which made a good production by flowing. Drilling is also being done near Dayton and Liberty and at Batson.

Another Well for Montana

The Roundup Oil & Gas Co., drilling about a mile and a half from the Verduzen well, near Roundup, Mont., have penetrated the oil sands and on Feb. 17 struck oil which appears to be in commercial quantities. This is the second well of importance which has been drilled in the state. The Vanduzen, the first well to be brought in, pumped at the rate of 360 bbl. in 24 hours on a test which was recently conducted.

TEXAS NOTES

Another raise in Gulf coast oil has been announced by the Texas Co., which has raised its West Columbia crude to $1.75 per barrel. This company's pipe line from West Columbia to the Houston ship channel is completed, and dredging across the channel to extend the line to the storage tanks at Clinton is under way.

The Empire Pipe Line Co., a subsidiary of the Cities Service Co., is constructing its 64-mile Burkburnett-Healdton line to connect with the Healdton-Gainsville pipe line, supplying the Empire refinery at Gainsville, Tex.

The gas supply for Dallas, Tex., and other places furnished by the Lone Star Gas Co. is sufficient to last five to ten years, according to a preliminary report by E. W. Shaw, government gas expert. This supply can only be obtained by strict conservation; and, it is reported, industrial users should be cut off during the winter months to insure sufficient pressure for domestic fuel.

At Goose Creek, in Harris Co., Tex., F. B. West & Co. completed No. 5 Wright well, and the Humble Oil & Refining Co. its No. 13 Gaillard; both are pumping. E. F. Simms Co. will pump No. 29 Smith well soon. One well in this field was abandoned, the No. 16 Isenhour of the Texas Co. It was reported a short time ago that the No. 1 Webb well of the Humble Oil & Refining Co., at Humble, was a gusher, but this proved to be a mistake; the well is still being drilled.

The Gulf Refining Co. has its new oil distributing plant in operation at Galveston, Tex. Oil is received in tank steamers from Tampico and in barges from Port Arthur. It is pumped into storage tanks, and from these into the railroad tank-cars. Oil is now being delivered to the Gulf, Colorado & Santa Fé R.R., and will also be supplied to the Gulf Coast R.R. under contract in a short time.

Considerable excitement prevails at Benavides, Duval Co., Tex., as the time for "drilling in" at the No. 1 Becker well of the Empire Gas & Fuel Co. approaches. It is confidently expected that a new oil field will be opened here.

White Point Gas Well Shut Off

The White Point gas well, near Corpus Christi, Nueces Co., Tex., has finally been shut off. This well, one of the largest gas producers in the world, has been flowing wild at the rate of 5,000,000 cu.ft. of gas daily for some time. The gas may now be piped to Corpus Christi and San Antonio, and a gasoline plant built.

Drilling in Derbyshire, England, Not a Howling Success

Only One of Seven Wells Is Producing Oil and That Only Flows About Seven Barrels a Day—Also Drilling Elsewhere

According to Commerce Reports, the best available information is that while boring for oil in Derbyshire continues, the expectations of experts will not be realized. A report of January 2 is to the effect that out of seven wells sunk, only one is yielding oil, and that one is at Hardstoft, near Chesterfield, on Lord Hartington's estate. The flow averages 2,000 gallons weekly, and there has been some speculation as to the wisdom of putting down machinery to pump the oil. Thus far nothing has been done.

Drilling has been undertaken at Ridgeway and Eckington, near Sheffield; Brimington and Brimington Commons, near Chesterfield; and Ironville, near Nottingham, with unknown results. Much water has been encountered and some gas, but apparently nothing which gives evidence of the presence of oil in substantial quantities.

Will Develop Graham Island, B. C.

A syndicate recently formed for the purpose of boring for petroleum on Graham Island has already begun operations, according to advices received by the Bureau of Foreign and Domestic Commerce from Prince Rupert, B. C. The organization, headed by W. A. Lethwaite, of Victoria, has secured the mineral rights on a considerable extent of territory in the southern part of the island.

Although this is the first attempt to prospect on these islands, the report states, signs indicating that oil might be found there have been prevalent for some time. The syndicate was formed in London, it was stated, and more than £100,000 was subscribed to the project.

Bad Roads a Handicap in Arizona

Drilling operations around Holbrook, Ariz. have been impeded and in some cases suspended because the clay roads have defied all efforts at transportation of machinery or supplies from the railroad to the wells. The Adamana has shut down to await receipt of a heavier rig. The Holbrook denies any intention of sale and will renew activity with better weather.

It has been announced that San Saba County will pay a bonus of $20,000 for the first 300-bbl. oil well completed in the San Saba field. The demand for drilling contracts has increased in consequence.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Chronology of Mining, January, 1920

Jan. 1—Empire Steel & Iron Co., Oxford, N. J., raised all mining employees' wages by 50c. a day.

Jan. 3—Severe earthquake centered near Mt. Orizaba, Mexico, damaged villages of Teocele and Coutzlan; shocks on Jan. 6 and 22 completed the destruction of these villages.

Jan. 5—Mexico oil export tax was increased 10 per cent; Mexico removed import duties from gasoline and other petroleum products.—Primos Chemical Co. holdings purchased by Charles M. Schwab for $4,000,000, and transferred to Vanadium Corporation of America.

Jan. 6—Edward Brush, vice-president of American Smelting & Refining Co., died.

Jan. 8—National Committee of the Steel Workers' Union called off strike in steel mills and furnaces.—Bunker Hill & Sullivan Mining & Concentrating Co., Wallace, Idaho, experimental mill burned down.

Jan. 10—Lassen Peak in eruption.

Jan. 12—Senate asked Alien Property Custodian concerning reported sale of American Metal Co. voting certificates to German interests.—First hearings before Wilson Bituminous Coal Industry Commission.

Jan. 13—Idaho Supreme Court confirmed title of Virginia lode claims, in Beaver district, to the Consolidated Interstate-Callahan and others.—San Francisco section, American Institute of Mining and Metallurgical Engineers, met and elected officers.—Electrical Workers' Union at the Utah Power & Light Co. struck without warning.

Jan. 14—Dredge operators of California met at Marigold, Cal.—House of Representatives passed Indian citizenship bill which would thus finally dispose of tribal properties.

Jan. 15—Conference held at Washington on Natural Gas Conservation. Franklin K. Lane presided.—R. C. MacLaurin, president of Massachusetts Institute of Technology, died of pneumonia.

Jan. 17—Homestake company's Amicus mill, 240 stamps, put in commission.—British America Nickel Corp., Ltd., blew in new nickel-copper smelter at Nickelton, Ont.—President Carranza authorized temporary permits for oil-drilling in Mexico.

Jan. 20—Carranza notified Huasteca Petroleum and other oil companies that he has authorized temporary drilling permits.

Jan. 20-22—Colorado Metal Mining Association's 7th annual meeting was held at Denver, Col.

Jan. 21—British American Nickel Corp., Ltd., put into commission the first of its big Pierce-Smith converters at Nickelton, Ont.

Jan. 22—Secretary of State Lansing received official confirmation of Carranza's decision to grant temporary drilling permits.

Jan. 23—Jacob Simon Herzog, alias George Graham Rice, judged guilty of grand larceny in the first degree at New York City and remanded to prison for sentence.

Jan. 29—Hearing of arguments in the Utah Apex suit began at Salt Lake City.

Ontario Mining Association Organized

Largest Operators Pledge Financial Support—Headquarters To Be in Toronto

Mine operators from all parts of Ontario met in Toronto on Feb. 11 and 12 for the purpose of organizing the Ontario Mining Association. The idea met with enthusiastic approval, and about twenty-five companies, represented at the meeting, pledged themselves to its support. Assessment will be made on the basis of the number of men employed, and the representation at the meeting assured financial support sufficient to carry on the organization for the next year. A permanent secretary will be appointed who will have headquarters in Toronto, and he will be supported by a board of nine directors, from among whom will be appointed an executive committee of five. A strong effort will be made to increase the membership.

Assay Commission Appointed

Upon the recommendation of the Secretary of the Treasury, the President has appointed the following as members of the Annual Assay Commission:

Representative William A. Ashbrook, Ohio; J. Edward Barry, Cambridge, Mass.; John Stewart Bryan, Richmond, Va.; Col. Richard Burgess, El Paso, Tex.; Senator Arthur Capper, Kan.; George H. Dern, Salt Lake, Utah; Mrs. Kellogg Fairbanks, Chicago, Ill.; Louis Fischer, Washington, D. C.; T. V. Gregory, Emlenton, Pa.; Dr. J. M. Henderson, Columbus, Ohio; Dr. A. R. Johnson, Reevesville, S. C.; Sedgwick Kistler, Lock Haven, Pa.; Mrs. B. B. Munford, Richmond, Va.; Joseph H. O'Neil, Boston, Mass.; Representative John M. Rose, Pa.; Harry Scheeline, Reno, Nev.; 'Till Taylor, Pendleton, Ore.; Samuel W. Traylor, Allentown, Pa.; R. A. Underwood, Plainview, Tex.; Garland E. Vaughan, Lynchburg, Va.; Representative Albert H. Vestal, Ind.; N. B. Westcott, Onley, Va.; and Charles E. Wright, Montpelier, Idaho.

To Hold Flotation Conference at Idaho School of Mines

It is planned to hold a conference or post-graduate course in the principles and practice of flotation at the School of Mines, Moscow, Idaho, during the week of Feb. 23 to 28 inclusive. The aim of this course is to afford to men conversant with the mining industry, an opportunity to familiarize themselves with the most important development which has ever occurred in the field of ore treatment.

The first four days of the course (Feb. 23 to 26) will be devoted to a study of the fundamental principles underlying flotation so far as they are understood. Daily lectures by members of the University faculty supplemented by demonstrations and laboratory testing will be used as a means of presentation. Feb. 27 and 28 will be given to the discussion of flotation by experts in this field from the government service and from professional life. This part of the course will coincide with a meeting of the Columbia Section of American Institute of Mining and Metallurgical Engineers, at which addresses and papers will be delivered by members of the U. S. Bureau of Mines staff, and by well-known specialists in flotation, in preparation of ores for flotation and in treatment of flotation concentrates.

Institute of Metals

Membership Increasing—Local Sections Developing

The Institute of Metals, London, writes that its approaching ballot on March 3 is likely to constitute a record in its history. Applications for membership from all over the kingdom are coming in very rapidly; indeed, 1,200 such had already been received by Jan. 10. This growth is being reflected in the increasing interest in, and activity of, the three local sections organized at Birmingham, Glasgow, and Sheffield, and it has been found desirable to print a small card of convenient pocket size, which presents the names of the general and local officers, the dates of the meetings arranged for the year, together with the titles of papers to be presented.

From the card it appears that, in addition to the London meetings in March, May, and September, the Birmingham local section, will hold five meetings before April 30, the Scottish local section will meet at Glasgow twice, under chairmanship of C. H. Desch, and the Sheffield local section will meet four times under chairmanship of W. R. Barclay. At all but two of these local meetings valuable papers are scheduled.

THE MINING NEWS

LEADING EVENTS

Underground Workers Strike at Bingham Canyon, Utah

Six Dollars Asked for Eight-Hour Day from Collar to Collar—Attributed to I. W. W.

The camp of Bingham, Utah, is the scene of a strike, which was begun at seven o'clock on Feb. 10 by underground workers, understood to be acting under the leadership of the I. W. W. The demands were for an eight-hour day from "collar to collar" and $6 a day in wages as well as certain changes in conditions.

At first the United States company's properties and that of the Utah Metal & Tunnel Co. were closed down, while the Utah Apex and the Utah Consolidated worked with partial shifts. The Utah Copper Co., employing surface labor almost entirely, was unaffected, although a strike call was issued to the men for an eight-hour day with $1 additional pay.

The most recent developments are that Utah Apex is again working sixty men underground and its entire surface force. The Utah Consolidated is working fifty to sixty men underground, also its entire surface crew. The United States properties are employing all surface men and are increasing their underground forces. The Utah Copper Co. and the Bingham Mines have not thus far been affected by the strike.

Albert Wills, alleged to be the I. W. W. leader, at a mass meeting in Bingham promised to call out the miners in Park City and went there with twenty supporters to call a strike, but was unable to do so. The Park City miners at a mass meeting voted against a strike, 250 to 15, and remained at work. Conditions are now quiet and orderly at both camps. In general, the mines have full surface crews and are increasing their underground forces.

Gold Premium Benefiting Ontario Producers

Some months ago there was a good deal of agitation, originating in Porcupine and Kirkland Lake, for a government bounty on gold. Without any action on the part of the Government, the producers are now getting a substantial premium, owing to the high exchange rates between Canada and the United States, and at the present time are getting about $24 an ounce for their gold. While exchange may sell higher than its present rate of about 16⅔ per cent, it is probable that it will average lower than this for the year, but will still be high enough to give a substantial premium to the gold producers.

Lake Superior Iron Companies Raise Wages Ten Per Cent

Labor Shortage Anticipated During Coming Season—Call for Large Tonnage Expected

Following the lead of the Oliver Iron Mining Co., all of the Lake Superior companies have advanced wages 10 per cent, effective as from Feb. 1. Day laborers and salaried men are benefited by the increase. The wages now being paid at the mines are the highest ever recorded in the district, but it is believed that there will be a shortage of labor during the active shipping season. There is no surplus to speak of at the present time and many have left the mining towns for the larger industrial centers, particularly Detroit, Flint, Pontiac and Saginaw, in the lower part of Michigan, and many foreign miners have returned to their former homes in Europe.

It is thought that the labor situation will be acute if the miners are called upon to furnish a large tonnage this year, and it looks very much as if such a call would be made. A number of mines that were closed down last year are again mining ore, four Menominee range properties having resumed operations within the last month. The outlook for the district was never more bright than it is right now, and 1920 will be acute if the mines are called troubles arise.

The operators of the district are looking forward to a big year in the iron business and are well satisfied with the new price schedule, which calls for an increase of $1 a ton over the 1919 prices. Old range bessemer now commands $7.45 a ton and non-bessemer is quoted at $6.70, the highest figures reported since the early eighties. Mesabi bessemer at $7.20 a ton and non-bessemer at $6.55 mark the highest prices ever recorded in the history of the Minnesota ranges. Large sales of ore have been made at the above figures and it is certain that most of the ore in stock which was carried over from last season will be moved during 1920.

Lake freights have also been advanced, the rate from the head of the lakes to Lake Erie ports being $1.10 a ton, as compared with 90c. in 1919. The rate from Marquette is $1 a ton and from Escanaba it is 85c., being an increase of 15c. a ton in each case. The new iron ore price schedule stipulates that if vessel rates are lowered iron ore prices shall be lowered accordingly, but it is not believed that lake rates will be any lower than they stand at present, since present conditions are not likely to bring about a decrease.

Repeal of Mine Taxation Laws of Colorado To Be Sought

State Tax Commission Holds Metal Interests Escape Just Burden—Committee Named To Draft Bill

Backed by the Colorado Tax Commission, an organized effort is being made to have initiated at the November election in Colorado a bill to repeal the present mine taxation laws.

Under the present law mining property is divided for taxation purposes into two classes, producing and non-producing. Property producing less than $5,000 annually is defined as non-producing. This property is "assessed and taxed like other property according to the value thereof." In order that the County Assessors might have a uniform basis of valuation, it was agreed at their annual meeting some years ago, that they should fix a valuation of $60 per acre for all non-producing claims and since that time they have been so assessed throughout the state. The improvements take a separate valuation and are "taxed at their full cash value."

Producing claims (those making an annual output exceeding $5,000 annually) are listed at a valuation determined by production. For taxation purposes the producing mine is valued at one-fourth of the gross annual output, provided that the net does not exceed that amount; should it do so, the net fixes the taxation value. The net is determined by deducting from the gross the cost of extracting the ore together with freight and treatment charges.

The Colorado Tax Commission contends that the metal mining interests of the state are escaping their fair burden of taxation and that "metal mining property should be assessed at its actual value, the same as other property." Mine owners claim that they are already paying more than their just proportion of taxes, that the industry is in no condition to bear additional burdens, and that furthermore there is no way of determining the "actual value" of a mine and that any attempt to so fix a value would lead to endless trouble and litigation.

At the annual meeting of the County Commissioners of the state, arrangements were made for the appointment of a committee consisting of a representative from the following organizations: The State Tax Commission, the State Association of County Commissioners, the State Association of County Assessors, the Colorado Metal Mining Association, the Colorado Live Stock Association and the State Grange, which are to meet with the idea of

evolving an initiated bill to be submitted to the general election in November, 1920.

This committee will meet during the coming month and the result of its deliberation will be watched with much interest by the mining men of the state.

Smelter at Salida, Col., Closes Down Indefinitely

The Ohio & Colorado Smelting & Refining Co., at Salida, Col., operating the only independent smelting plant in the state, closed down the first part of February and, according to the management, will remain closed for an indefinite period. The company is a subsidiary of the American Metals Co. The plant was constructed at Salida in 1901 and has been operated continuously since that time.

Unfavorable freight rates and the difficulty in obtaining sufficient quantities of siliceous and lead ores made the operation of the plant unprofitable and the stockholders decided to cease operations until conditions are more favorable. The company employed about 200 men when in full operation. Ores which were formerly treated at Salida will now be diverted to the Leadville or Pueblo plants of the American Smelting & Refining Co.

Gogebic Range Iron Companies Rearranging Cost Systems

Several of the iron mining companies operating on the Gogebic Range in Michigan are rearranging their systems of cost accounting to a uniform system. Among other advantages, this change will better enable the state tax commission to compare costs of production and thus to arrive at more equitable valuations for the several properties. The method used for valuating is to estimate future annual production and ore reserves from maps submitted by the mining companies and from underground inspections. Then, the average net profit per ton for the last five years is obtained from the companies' books, and is assumed to be the average net profit which will be realized on the present ore reserves. This taken with the estimated annual production will give the estimated annual profit, which is taken as an annuity for the life of the present ore reserves. The present value of this annuity is taken as the value of the mine, surface equipment being considered separately. Under old accounting systems a fair comparison of "net profits" was difficult to arrive at.

Hearing of a charge of contempt brought by the Minerals Separation, Ltd., of London, against the Butte & Superior Mining Co. in connection with the oil flotation patent infringement case, was recently postponed indefinitely by Federal Judge George M. Bourquin without the court even hearing a denial from the Butte & Superior.

Tonopah and Divide Operators Make New Wage Agreement

Pay Advanced Fifty Cents—Company Commissary To Remain—Restrictions on Price of Board Removed

Following the withdrawal of the 50-c. bonus on Feb. 8 in the Tonopah-Divide district of Nevada, many of the miners quit work but the crafts unions stayed by their contract generally as signed Nov. 7 last. The operators after consultation with the executive heads of the crafts and miners' unions decided to offer amendments to the old agreement. The terms offered include continuation of the company commissary, the removal of all rate restrictions on the price of board at the company boarding houses and an advance of 50c. per shift to all employees. The offer was accepted and signed on Feb. 13. The agreement is to last one year. Normal operations have been resumed in practically all the mines of the district. The miners quit, it is said, because of threats made by radicals. The text of the new agreement is given as follows:

Whereas, a certain written agreement was entered into on Nov. 7, 1919, between the Tonopah and Divide Mine Operators' Association and the Tonopah Trades Assembly and the Tonopah and Divide Mine and Mill Workers' Association, copy of which is attached hereto; and, whereas, the terms of said agreement do not seem to be satisfactory to the majority of the mine workers of the mines of the Tonopah and Divide mining districts; therefore be it resolved: That we, the Tonopah and Divide Mine Operators' Association, do submit herewith the following amendments to said written contract:

First—The Tonopah and Divide Mine Operators' Association agree to continue the operation of its commissary under the present form of management and to sell goods at not to exceed 5 per cent above cost. If at any time the volume of business transacted does not justify the continuation of the store, the Tonopah and Divide Mine Operators' Association reserve the right to discontinue its operation and liquidate the business.

Second—Coal shall be sold and delivered to all employees at cost so long as present contract with the National Coal Co. remains in force. The present contract expires on Jan. 1, 1921.

Third—Operators will grant a wage increase to all employees of fifty (50) cents per shift, effective from date joint agreement may be entered into and ratified by both the Tonopah and Divide Mine Operators' Association and the mine workers, for a period of one year from said date. This wage increase to be retroactive to Feb. 8, 1920, to all employees who continued at work and are still on the pay roll.

Fourth—The fifth clause in agreement dated Nov. 7, 1919, providing that board shall be given to single men at $37.50 per month where boarding-houses are now or hereafter operated by companies is hereby canceled.

Classifying Mineral Resources of British Empire

Work of the Imperial Mineral Resources Bureau, the governmental body started during the war, has progressed rapidly since 1917, according to Sir Richard Redmayne, chairman. Regarding present activities of the bureau Sir Richard said:

"The bureau is engaged in an extensive system of classification of the Empire's mineral resources, and is on the eve of publishing in parts a digest of statistical and general information relative thereto and to foreign countries. Considerable leeway has had to be made up owing to many countries having ceased to issue statistics during the war, and an effort is being made by the bureau to fill in the hiatus.

"The bureau has framed suggestions for a uniform system throughout the Empire of collecting and publishing intelligence regarding mineral resources. Considerable overlapping and squandering of energy and funds continues to exist. Where so many interests, chiefly of a Government departmental nature, are concerned, the eradication of this overlapping of departments calls for delicate, though firm, handling."

The Governors have proposed to the Dominions, India and the Crown Colonies that, were there established in each a highly qualified member of their mining or geological staff to act as a corresponding member of the bureau it would conduce to a still closer connection of the component parts of the Empire. Recently the Union of South Africa and the Government of India each dispatched a technical representative to the United Kingdom to keep in close touch with the bureau. The experiment has met with unqualified success.

Changes in Ontario Mines Act Probable

It is understood that at the coming session of the Ontario Government several changes will be made in the Mines Act. In order to assist the prospector, the recording fee will be decreased from $10 to $5. To offset this, however, and to help stop the general practice of staking a larger number of claims under different licenses, the fee will be $15 for those claims staked by one person on behalf of another. Arrangements are also to be made to reduce the cost of assaying for bona fide prospectors, and also to reduce the cost of blue prints from the recorders.

In a report to the State Department the American Consul at Chihuahua, Mexico, tells of the great difficulties which have accompanied the operation of the plant of the American Smelting & Refining Co. at Chihuahua due to the difficulties in securing coal. The high price of silver, the Consul states, has resulted in great stimulation to mining throughout the Chihuahua district, despite banditry.

Mexican Bandits Kidnap Mine Superintendent in Zacatecas

Washington Asks Mexican Authorities To Effect Release of W. W. Adams, Employed by American Metal Co.

Wilson Welsh Adams, an American employed as superintendent of the Providencia mine of the Compania de Minerales y Metales, a subsidiary of the American Metal Co., has been captured by bandits in Zacatecas, Mex., according to a report made to the State Department at Washington on Feb. 16. He is being held for 50,000 pesos ransom. Adams' home is in Los Angeles where his wife and child are living. The kidnapping took place at Avalos, Feb. 13. The bandits are reported to have looted the warehouse at the mine.

The American Embassy at Mexico City has been instructed by the State Department to bring the kidnapping to the attention of the Mexican authorities, with the request that every step be taken to obtain Adams' release.

The American representatives at Saltillo and Monterrey, in reporting the incident, said that authorities in Zacatecas were endeavoring to learn the whereabouts of Adams and his captors, and that three columns of Mexican troops had been sent out.

Primos Chemical Co. Completes Transfer to Vanadium Corp.

The transfer of the properties of the Primos Chemical Co. to the Vanadium Corporation of America has been completed, the latter company taking over the Colorado mines operated by the Primos Chemical Co., the Primos Exploration Co. and the Primos Mining & Milling Co. The properties consisted of tungsten holdings in Boulder County, molybdenum properties in Clear Creek County and vanadium mines in San Miguel County. Robert Sterling, assistant manager of the Primos companies, has been appointed Colorado manager for the Vanadium company. He announces that only the vanadium properties will be operated at this time and that all operations in Boulder and Clear Creek counties will be discontinued indefinitely.

During the war these properties were the largest producers of the minerals named in the state, but early in 1918 operations on the tungsten and molybdenum properties practically ceased and no production from these mines has been made made since that time. The vanadium property is extensively worked, several hundred men being employed.

At the recent annual meeting of the Colorado Metal Mining Association George M. Taylor, of Colorado Springs, was elected president, Jesse F. McDonald, of Leadville, first vice president, R. M. Henderson, of Breckenridge, second vice president, and L. A. Ewing, of Boulder, third vice president. A. M. Collins, of Creede, was elected treasurer and M. B. Tomblin, of Denver, secretary.

Spitzbergen's Mineral Resources Exaggerated

Coal Abundant but Glowing Reports as to Large Metal Deposits Not Warranted by Available Facts

By Our Scandinavian Correspondent

The treaty by which Norway receives sovereignty over the Spitzbergen archipelago was signed in Paris in the Clock Hall of the Foreign Ministry on Feb. 9.

The acquisition by Norway of sovereignty over the Spitzbergen group of islands and its bearing on foreign mining rights previously staked and in operation have again drawn attention to the mineral possibilities of the group. From data available it would appear that among the going concerns Norwegian interests largely preponderate.

In 1916 the Great Norwegian Spitzbergen Coal Co. with a capital of 9,000,000 kroner, acquired the properties of the Green Harbor Coal Co., the Arctic Coal Co., Chr. Anker and Norsk Spitzbergen Kulkompani, and Kulspids Co. The mines of the British Spitzbergen Coal & Trading Co. have also been taken over by Norwegian interests.

At Kings Bay on the west coast (to which all mining activities are at present confined) the Norwegian Kings Bay Kulkompani took over the Chr. Anker estate in 1916. Practically all of the Norwegian mines of any importance are on the south side of Isefjord, on the west coast. At Bell Sound on the same coast, further south, the Swedish A. B. Spitzbergen Svenska Kolfelter is operating its Braganza Bay property. A Russian company, with claims near Green Harbor, under a sub-contract to a Norwegian engineer shipped about 2,000 tons in 1918. The Norwegian State has two post offices and a wireless station on the islands.

British Exploration Co.'s Operations

The British Northern Exploration Co.'s properties are situated on Bell Sound, at Prince Charles Foreland, Klaas Billen Bay and other places. The company, with a nominal capital of £500,000, all issued, states that it sent out an expedition last summer to its estates, which cover nearly 3,000 sq.mi., and that a program of considerable magnitude was successfully carried through in the limited time available. It points out that "Lord Curzon desires it to be known that the treaty secures complete equality of treatment to all nationals of the high contracting parties with regard to acquisition, enjoyment and exercise of the rights of property, including mining rights."

In its preliminary reports the company dealt with the great advantage entailed by a cheap delivery of Spitzbergen minerals at English ports and laid stress on the vast extent of its magnetic iron ore and coal deposits, comparing the former favorably with the ore mountains of northern Sweden, and enlarging on the importance of this new source of supply at a time when these raw materials were on the decrease.

It is possible that the company has made other and more valuable finds than those already known to Scandinavian technicians who had also visited these districts. If so, there should be no reason at this date, and in the face of adverse criticism, why the information should be withheld.

Testimony of Professor Vogt

So far as the magnetic iron ore deposits at Research Bay are concerned, Professor Vogt is of opinion that they are of no national economic importance. He bases this opinion on the detailed reports of Norwegian and Swedish mining men who have an accurate knowledge of northern iron ores and their geological character. According to these reports, the deposit in question consists of strips of quite pure ore running about 65 per cent iron and low in phosphorus and sulphur, but interbedded with layers of native rock. The ore would therefore require careful sorting or mechanical separation. Longitudinally the ore bed may be measured in kilometers. Its depth, on the other hand, seemed small enough to be calculated in a few meters. The average iron content of the ore-containing strata, Professor Vogt states, is so small that, according to the most detailed reports, no reliable results were obtained with the magnetic needle, though the ore is magnetic. Even small deposits of iron ore, if they are rich, give satisfactory reading results with the needle. Professor Vogt concludes: "It is evident from the foregoing that it is quite without warrant to speak of such a deposit as being of any national economic importance whatever."

Docent Adolf Hoel in a recent paper before the Norwegian Geological Society on "Spitzbergen Coal and Ore Deposits, Their Economic Importance and Apportionment Between the Foreign Nations," referred to the moraine ores of Prince Charles Foreland and their source as discovered by him in 1909. This source, or ore strip, he stated, is now known at several points where it follows the coast line. Among other places it is known on the north side of Bell Sound and at Martins Range near Research Bay. With the possible exception of the Prince Charles Foreland deposit, this ore zone is without the least economic importance. In no place are the ore layers of greater thickness than a couple of decimeters, and there are often parallel strips of which the most are a little under or over a centimeter in thickness. Where the ore in these strips is good, running 60-65 per cent Fe, 0.01-0.02 per cent P, and 0.04-0.10 per cent S, the deposits are too poor to mine, even if they were situated in a more favorable place than Spitzbergen.

Touching on the marble quarries at Kings Bay, Docent Hoel is of the opin-

ion that they cannot be economically worked owing to uniform splintering. No marble has been shipped, and since 1913 the plant has been practically abandoned. Of other minerals he thought it might pay to exploit a zinc blende prospect at Bell Sound and an asbestos occurrence at Research Bay, from which 17 tons had been shipped by the A. S. Kulspids of Christiania in 1917-18. From the Cape Thordsen Peninsula 200 tons of phosphorite was shipped by the Chr. Anker Co. in 1917-18, but was found too poor in quality for use. Also from the same neighborhood 160 tons of excellent gypsum was shipped in 1917-18 from a zone 40 meters wide. Apart from these possible exceptions and coal, Mr. Hoel was unaware of any other deposits it would pay to operate. It had been held, he said, by some that Spitzbergen's mineral riches were colossal, but, as a matter of fact, aside from coal Spitzbergen was poor in mineral raw material. He gave the following figures as being characteristic of the several owning interests and their shipments in 1918: Norway, about 55,000 tons, employing 600 men. Sweden, 4,000 tons, with 100 men, Russia, 2,500 tons, with 40 men, and England, no shipments, with 50 men.

Spitzbergen's shipping activities, and indirectly therefore its mining and construction operations, will always be governed by ice conditions. The movements of the drift ice may be ordered in periods, or they may not. They are at present unknown, sinister and incalculable. The ice has its source from the seas between Franz Josef's Land and Spitzbergen, and is reinforced by supplies from Storfjorden on the east coast of Spitzbergen. The drift ice is conveyed westerly by a stream to the South Cape, around which it takes a course northerly and in a bad season during summer months may block in the whole of the west coast mining camps all the way up to Prince Charles Foreland. Last year, for instance, Isefjorden was clear of ice in the middle of April, and Advent Bay by the middle of June. In 1915 the west coast was blocked with drift ice nearly the whole of the summer; 1916 was another bad year in the same respect. At other times when the drift ice is absent the inner reaches and bays are still unduly ice-bound.

One Big Union Headquarters Established in Cobalt

The One Big Union has opened headquarters in Cobalt and is campaigning for members. It is stated that they are meeting with some success among the foreigners, particularly the Finns, but are obtaining very few members among the English speaking workmen. The activities of this organization will no doubt be closely watched by the Dominion police. Local labor men are making an effort to have vacancies on the Mine Inspector's staff filled by working miners, and the names of three men who have been very active in union affairs have been voted upon. It is believed by many that the new Minister of Mines is giving them a certain amount of encouragement. The Mines Inspection Department has an excellent record, both as to men and results achieved, and many hold that it would be extremely unfortunate if incompetent and unqualified men were appointed inspectors. The power given to inspectors under the law is such that with it in the hands of men not fitted for the position, managers would be operating under very unfortunate conditions.

Australian Gold Mining Aided by Export Premium

The gold mining industry of Australia has been very materially assisted during the last year by the premium obtained on the export of the precious metal. Without that, owing to the increased cost of supplies and labor, hardly a mine of any importance would have been able to operate profitably. The Bendigo Amalgamated is a case in point; partly due to a larger output in 1919 but principally to the premium received the company was able to convert a serious loss in 1918 into a good profit for 1919. The company's production from its group of mines last year was 46,511 oz. gold from 110,326 tons. For some time past (written Jan. 13) the fortnightly output has been about 4,000 tons, but the aim of the company is to treat double that tonnage; the plant is available and the only question is whether mine development can be kept sufficiently ahead of the mill. The company now has twenty mines open. Six main shafts are being sunk deeper, two with definite objectives. The Constellation gives every promise of a continuance of profitable returns for some time ahead, while excellent prospects are also being met with in the Unity and two or three other mines included in the amalgamation. A more hopeful feeling prevails regarding the future of other companies on other lines of reefs outside the amalgamation.

Revenue Gold Mines Near Norris, Mont., Under Development

Active development of the Revenue Consolidated Gold Mines near Norris, Mont., is in progress under the direction of G. D. B. Turner. The Montana Power Co. has completed a power transmission line from the Madison dam to the property. A 700-cu.ft. I. R. compressor driven by a 100-hp. G. E. motor, and an electric hoist will also be installed at the new shaft which is about 900 ft. from the old one. Sinking and raising at the same time are under way in the new shaft, over 100 ft. of which is completed and timbered.

These properties are credited with a production of $2,500,000 in gold down only to the 200 level. They were once in the bonanza group and are of considerable interest to mining men generally. The properties have been taken over by De Forest Candee and associates of New York under a lease and option to purchase. A contract has been made with the Montana Power Co. been made with the Montant Power Co. for electrical power. Four distinct shoots of gold ore are in evidence at the property, the mining of which was suspended two years ago owing to lack of power to handle the water met in the old shaft. The new shaft is 800 ft. north of a large fault which traverses the property and which carries the water of the mine. Little difficulty is expected when this is in operation and the workings are extended below the 200 level. There are four winzes sunk on the ore shoot about 200 ft. apart which show commercial value.

Recent Production Reports

The East Butte company produced 1,738,840 lb. copper and 65,668 oz. silver in January compared with 1,844,540 lb. copper and 71,421 oz. silver in December.

United Verde Extension produced 3,676,312 lb. of copper in January, against 3,740,024 in December.

Butte & Superior produced 13,000,000 lb. zinc in concentrates and 215,000 oz. silver in January with 94 per cent recovery. December's production was 14,000,000 lb. zinc and 215,000 oz. silver.

Davis Daly Copper Co. in December produced 1,192,900 lb. copper and 52,723 oz. silver, compared with 1,107,450 lb. copper and 45,647 oz. silver in November.

Arizona Copper Co. produced 3,000,000. lb. copper in January compared with 2,900,000 in December.

Alaska Gold Mines Co. in January milled 215,385 tons of ore averaging 88c. per ton. Percentage of extraction was 80 and the tailings loss 17.6c. per ton.

Compagnie du Boleo, at Santa Rosalia, Baja California, produced 948,080 lb. copper in December.

Burma Corporation, Namtu, Burma, produced 4,822,720 lb. lead in December from 5,526 tons of lead bearing material. Refined lead production was 3,689,280 lb. and that of refined silver approximately 187,350 oz.

Union Miniere du Haut Katanga, Elisabethville, Belgian Congo, produced 4,739,890 lb. copper in December.

Chile Copper Co.'s production in December was 6,016,000 lb. copper, compared with 10,000,000 lb. in November.

Cerro de Pasco's January output was 4,616,000 lb. copper, compared with 4,644,000 lb. in December.

Calumet & Hecla's production for January was 9,690,671 lb. of copper, as follows: Ahmeek, 1,533,300 lb.; Alloquez, 400,000; Calumet & Hecla, 5,462,220; Centennial, 122,600; Isle Royale, 1,060,094; La Salle, nothing; Osceola, 787,300; Superior, nothing; White Pine, 325,157.

Shipments of domestic copper ore, matte, etc., from Alaska to the United States, in January, were: 11,126 gross tons; copper content, 7,909,682 lb.; valued at $1,457,829.

The United States Smelting Co. is increasing the output of its coal properties in Utah month by month, December having shown 140,000 tons as compared to an average of 120,000 tons in October and November.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Emergency Tariff Bills To Come Before Senate

Magnesite and Glassware Bills Reported Unchanged—Zinc and Tungsten Measures Amended

Action in the Senate on the emergency tariff bills was assured when the Finance Committee of the Senate decided to report out the dye stuffs bill and when the bills providing tariff schedules for laboratory glassware, magnesite, zinc ores, cobalt, and tungsten were reported by the sub-committee to the full committee.

The laboratory glassware bill, which includes optical glass and scientific and surgical instruments, was reported to the full committee carrying the same duties as provided by the House, which were as follows: 60 per cent ad valorem on laboratory apparatus; 45 per cent ad valorem on optical glass; 45 per cent ad valorem on scientific instruments; and 60 per cent ad valorem on surgical instruments.

The magnesite bill also was unchanged. The duties provided are: One-half cent per pound on commercial ore; three-fourths of a cent per pound on calcined, dead-burned and grain magnesite, and 10 per cent ad valorem and three-fourths of a cent per pound on magnesite brick.

The zinc bill was amended so that zinc-bearing ores of all kinds are to pay a duty of two cents per pound on the zinc content rather than one cent, as provided by the House bill. The bill was also amended to carry the cobalt duty of 25 cents.

The tungsten bill was amended so as to provide for duty of $1.50 on the tungsten content of imports of alloy steel.

Mexico's Silver Output in 1919 Shows Gain

The silver production of Mexico in 1919 was approximately 75,000,000 oz., according to estimates of gold and silver exporters given to representatives of the Department of Commerce. Although the official figures for the entire year will not be available before April 1, 1920, the figures for the first nine months of 1919 point to a decided increase in the production of silver over that of the preceding year. The production in 1918 amounted to 62,225,344 oz. The production from January to September, 1919, amounted to 46,948,621 oz.

About 33,000,000 oz. of the silver produced in Mexico in 1919 was refined in that country. Three million ounces of this was retained in Mexico for coinage purposes, and the remaining 30,000,000 oz. was exported, practically all to the United States.

Chestatee Company's Attorney Bitterly Attacks Commission Before House Committee

Assails Conduct of Philip N. Moore as Commissioner—Senator Shaffroth Replies—Chrome Men Claim Shipping Board Did Not Keep Faith

A scathing attack on the War Minerals Relief Commission was made before the House Committee on Mines and Mining by W. S. Howard, attorney for the Chestatee Pyrite & Chemical Corporation, in summing up the case which had been made by that company before the committee. "The Commission," said Mr. Howard, "has not the slightest conception of what Congress intended by the passage of the War Minerals Relief Act. It has disregarded absolutely in each instance in the Chestatee case the crux of the Act which says that obligations incurred and money expended resulting in net losses are to be paid—not fifty cents on the dollar, not ten cents on the dollar, but are to be paid dollar for dollar.

"The predominating element in this commission is the engineer commissioner, Mr. Moore, and what did he do? In the face of the broad decisions of the Supreme Court of the United States, in an unbroken line, which say that all remedial legislation shall be construed liberally in the favor of the claimant and against the Government, he took advantage of each technicality, disregarded the evidence of every single, solitary witness that was introduced by this claimant and he threw all evidence to the four winds and had the unmitigated gall to stand before this committee the other day and say that where the evidence of anybody conflicts with 'my own opinion I reject it.'

"If this case were not so pathetic, if it were not so pitiful that two patriotic citizens of this country, responding to their country's call when we were facing an emergency, and if it were not that these two patriotic citizens, who have not put a dirty penny in this claim, were facing bankruptcy and waiting for the referee's hammer to fall on the last dollar they possess, this would be a farce comedy. The commissioner is sitting here laughing in the face of the advocates of the claimant when I am stating cold blooded facts to the committee, and I very much resent it.

"After disregarding every atom of testimony introduced by this claimant and disregarding the testimony of his own witness about the capacity of the mill and disregarding the statements made by the engineering employee, Watt, he incorporated in his report to the Secretary of the Interior that the mill had operated in a perfected state. Watt stated that the plant was in an uncompleted condition and had not operated in a completed state. The evidence of Watt was that the mill was in an uncompleted condition and that the claimant had been operating under many disadvantages. Then with the overwhelming testimony before that commission as to all that these Pratts ever agreed to do in the construction of the railroad—in every financing contract it was stated that the only thing they ever agreed to do was to grade the railroad—he puts in his report, warping the testimony of a man named Barker, who testified that certain advantages might accrue to the Gainesville & Northwestern railroad from the operation of the railroad, into a statement of fact that it would be very advantageous to the Pratts to build the entire railroad, and further saying that that was the reason why they intended to build this railroad and that this was a permanent improvement that resulted in value to the Pratts.

"Engineer Julihn said the property was capable of producing 1,300,000 tons and these gentlemen try to make you believe that the vein has pinched out. George L. Pratt and N. P. Pratt put $914,000 in cold cash into the property as patriots. Then after we passed this relief measure, thinking that we would come to Washington and sit around a table with business men and adjust these differences upon business principles, the commission has injected into this thing ratios of production, ratios of concentration, ratios of every other technical kind that possibly could be brought to bear, by which one of this commission, and he alone, has stood for eleven months between an honest adjustment of net losses by this Government.

"After the commission had made one mistake after another, one mathematical calculation after another that was absurd, the Secretary of the Interior in dealing with the law on the facts took the commission's basis of the calculation and the commission's plan. The law has not been construed correctly.

"There is not a dishonest penny in this claim. As a matter of fact, we could claim legitimately $309,000 more than we have asked."

Senator Shafroth, following Mr. Howard's summing up, took a few moments to defend the commission's honesty of purpose. He also defended Mr.

Moore's part in the awards. One point that he made at that time he brought out as follows:

"The expenditures were expenditures which I thought were of a permanent nature and for that reason did not come within the intent of the law. Now we may be mistaken. It may be that your construction will be different. It may be that someone else's construction would be different. All that we can do as between the Government and these persons is to try to do what we think should be done under the facts indicated. We have tried to do that. We have regarded permanent improvements as not within the contemplation of the act and by reason of that we held that the railroad, in our judgment, was one for a permanent investment."

In view of the statements made by Mr. Howard, the Secretary of the Interior and Van H. Manning, Director of the U. S. Bureau of Mines, were called before the committee. They stood vigorously behind the commission and expressed the conviction that its findings have been intelligent and just.

Following the summing up of the Chestatee case, the discussion of the chrome situation was taken up again with John H. Haak, representing the Southern Oregon Chrome Association and the Eastern Oregon Chrome Association. Mr. Haak introduced numerous documents to show Government stimulation and made particular point of the fact that Government stimulation should date from the time of certain representations made by the Director of the Oregon Bureau of Mines and Geology based on a letter received by the Director from George Otis Smith, Director of the U. S. Geological Survey, in which the needs for increasing the production of chrome ore were pointed out.

Considerable discussion was had of the failure to prevent imports during the time that the Shipping Board had ordered an absolute cessation of imports of chrome. Representative Wingo of the committee declared that the ship allocation committee of the U. S. Shipping Board failed to keep faith. He characterized the action of that committee as reprehensible in that certain importers apparently were allowed to get shipping and break the market, thereby putting a greater burden on the Government.

Testimony also was taken from Ross Blake, representing the Arkansas Manganese Association and from Herbert W. Smith, of the American Mining Congress.

Of the 9,000,000 men between the ages of 21 and 31 registered in the first draft, 284,456 were engaged in the extraction of minerals. Other classifications were as follows: Agriculture, 2,888,548; manufacturing and mechanical industries, 2,721,792; transportation, 953,062; trade, 618,331; clerical occupations, 548,835; domestic and personal service, 300,142; and professional service, 255,572.

General Leasing Bill Ready for President's Signature

Veto Thought Unlikely—Senate Accepted Conference Report Without Discussion

When the Senate, on Feb. 11, approved the conference report on the general leasing bill without a single word of discussion, no one was more surprised than Senator Smoot who has been one of the principal champions of the bill during its long legislative course.

There was some discussion of the conference report in the House and a roll call was demanded on its acceptance. The vote however, was overwhelmingly in favor of its adoption, 287 voting for it and only 13 against it.

Senator Smoot made the following statement exclusively for the *Engineering and Mining Journal:*

"This legislation, which I have had in mind for the last twelve years, means more to the Western States, including the thirteen public land states, than any piece of legislation passed by Congress in the last decade. Not only will it be of immense benefit to the states I mention, but to every state of the Union because of the stimulating effect that it will have on the mineral industry. The increased production of oil, which it insures alone, will be a great stimulus to industries throughout the Nation.

"Sight must not be lost of the fact that this is not solely an oil bill. It means great added activity in the recovery of all of the minerals mentioned in the bill. I am delighted that after the long fight we are assured at last that this long-needed legislation will find a place among our statutes."

At this writing the bill is in the hands of the Secretary of the Interior for a report. Secretary Lane has already expressed his approval of the bill. A few are of the opinion that the President will veto the measure but this is regarded as very unlikely. Even if he should, it is apparent that the bill will be passed over the veto.

Representative Sinnott, the chairman of the Public Lands Committee of the House, made the following brief explanation of the bill:

"The bill is practically the same as it passed the House last October. It is also modeled on the bill that passed the House at the last session and the session before and the session before.

"In brief, the bill does away with and repeals the present laws providing for the patenting and the absolute disposal by the Government of the mineral resources named in the bill. This bill is strictly a leasing bill. No longer can patents be issued deeding away these mineral resources of the Government, except as to some valid claims now existing upon mineral lands provided for in section 37 of the bill. But apart from that, no longer will oil, oil-shale, phosphate, sodium, or coal lands be deeded away by the Government.

"The bill provides for limited leases for coal lands, for oil and oil-shale lands, for phosphate lands, and for sodium lands, reserving to the Government certain royalties and rentals. In the case of coal the royalty is to be at least 5 cents per ton. In the case of oil in what is known as "wildcat" or unknown territory, where oil is discovered by an applicant or a permittee, the permittee pays 5 per cent of the value of the production on his leasehold. Then in known oil territory there is a limited lease for not exceeding 640 acres, for which lease the lessee must pay not less than 12½ per cent of the value of the production, and in addition to that he has to pay a certain bonus royalty, which bonus royalty will be determined by competitive bidding.

"The bill gives the Government control over the future operations of these leases. It provides for continuous, economical, and diligent development and operation of the leasehold, with provisions against waste, with provisions guarding the safety and welfare of miners, with provisions against monopoly for selling the products at reasonable prices, and other matters of that kind that are to be inserted in the leases. The violation of any of these provisions will work a forfeiture of the lease."

In explaining the distribution of the royalties collected Mr. Taylor, of Colorado, said:

"Ten per cent of all of the royalties derived from coal, oil, gas, phosphates, and so forth, goes to Uncle Sam direct. That is for the expense of administration. Of all the oil royalties that are now held up by receiverships and impounded in the various courts in litigation, amounting to several million dollars and held to await the determination by Congress or the courts as to what should become of it, 70 per cent goes into the reclamation fund for the purpose of aiding and encouraging irrigation projects and development throughout the West, and 20 per cent of that money goes to the states in which the oil was produced. California and Wyoming will each get a large sum, and the reclamation fund will get possibly $6,000,000. That is for the past production up to the passage of this bill. Hereafter the division is different. From this time on 37½ per cent of all the royalties derived by the Government that come from all the oil, and coal, and gas goes to the state in which they are produced and 52½ per cent of all such proceeds goes direct into the irrigation and reclamation fund, and the remaining 10 per cent goes to the Government for administration.

"This law will apply to some 750,000,000 acres of public land in the United States and Alaska. It is a great constructive piece of legislation. It means homes and occupations for millions of people and vast benefits to the entire Nation, and I am gratified and proud to have taken an humble part in the long struggle to bring about the enactment of this bill."

Johns Hopkins Professor Urges Passage of McFadden Bill

Should Put Currency on Unqualified Gold Basis and Avoid Dabbling in Bi-metallism

Discussing the repurchase clause of the Pittman Act before the sub-committee of the House Banking and Currency Committee which is considering the McFadden silver bill, Dr. Jacob H. Hollander, professor of political economy at Johns Hopkins University, said:

"There are three distinct reasons for the passage of the measure now under consideration. The first is that it will establish our currency system upon an unqualified gold basis by ridding the circulation of a cumbersome heritage of our bi-metallic dabbling, at present quiescent but likely at some future time to rise again and to plague us.

"The second reason is that it will permit the reduction, to a corresponding extent, of the country's very considerable floating debt, without resort to a funding operation and without exclusive reliance upon the Treasury's present improvident device of providing for its floating indebtedness by anticipating the income and excess profits tax receipts of future years.

"The third reason is that it will effect a gradual and salutary correction of our present inflated circulating medium by less drastic means than still higher discount rates or bolder release of the gold reserve of our Federal Reserve System."

Patents of Government Employees To Be Secured to Public

So that the public and the industries may benefit by the scientific conceptions, inventions and patents of the employees of the technical bureaus at Washington, the Committee on Patents has reported the Norris bill (S-3223) to the Senate and has urged its immediate consideration. Among the reasons ascribed for the enactment of the legislation, which authorizes the Federal Trade Commission to administer such rights for the public, the more important are the following:

"1. There is no fixed or general policy dealing with inventions and patents developed by Government employees in the course, or as a result of, their official duties, and consequently no Governmental administrative machinery for translating such inventions and patents into actual public service.

"2. In cases where patents are developed by the combined efforts of Government employees and others, difficulties at present arise concerning the administration of the same because of the conflict between the rights of the inventors and those of the United States.

"3. There is no way at present by which patentees in or outside the Government service can dedicate their patents to the public with the assurance that the public will reap the full benefit therefrom, because an invention covered by a patent so dedicated does not interest capital, and because it may be excluded from public use by patents subsequently taken out by others."

Survey Gets Less for Alaska Work Than Last Year

Despite the fact that $100,000 will not go as far as it would in pre-war years when it was customary to vote that amount for the work done by the U. S. Geological Survey in Alaska, the House has allowed only $75,000 for such work during the fiscal year ending June 30, 1921. It is not regarded as probable that the Senate will increase this amount.

Dr. George Otis Smith, Director of the Survey, pointed out to the Appropriations Committee that during the twenty-three years that this work has been conducted in Alaska, the Survey's expenditures have been only 0.4 per cent of the value of the mineral production during that period.

NEWS BY MINING DISTRICTS

ALASKA

Nixon—A vein of high-grade gold and silver ore is reported, via Seattle, to have been made at Nixon, Alaska, thirty-six miles from McGrath, eleven miles from the Kuskokwim River. Three veins have been determined.

ALABAMA

January Production of Pig Iron Large —Other Furnaces To Be Blown in

Birmingham—Pig iron production of the Birmingham district reached the 205,000-ton mark in January. This is a greater production than for any one month of 1919 excepting October. It was the production of twenty-three furnaces. There are a number of furnaces now under repairs and others that are to be blown in soon. The pig iron market continues very strong and it has been reported that some manufacturers have sold some No. 2 foundry iron at $42 per ton for delivery in the last half of 1920.

ARIZONA

Jerome—Good results are expected from a north drift on the 1,500 level of the United Verde Extension, that has just been started to develop bodies of chalcopyrite and chalcocite already exposed on the upper level.

The working force of the Jerome Superior has been increased from 50 to 100 men, especially to speed development at three points on the 700 level. A compressor of 100-ft. capacity, operated by a 250-hp. engine, has been added to the surface equipment. Drilling has been started to prospect the formation west from the 486-ft. west crosscut.

Octave—The Mildred Gold has completed its 10-stamp mill, for which an ample ore supply has been developed on the 350 level, according to Leonard White, superintendent.

Miami—Sinking of the No. 1 shaft of the Van Dyke Copper Co. is progressing at a rate that bids fair to eclipse the present world's record for shaft sinking, made at the Crown Mines in South Africa. For the six days ended Feb. 10 the shaft had been driven 61 ft. The shaft is 816 ft. deep.

Hayden—At the Magma Chief property development has been started on the 300-ft. level, opening up the shoots of ore encountered above. The company is planning to install a larger compressor and other equipment to facilitate handling of the work. Shipments of high-grade ore to the smelter continue though somewhat retarded by bad traveling on the mountain roads. F. T. Pomeroy, secretary of the company, recently made a trip to the property.

Bellevue—The Arizona-Globe Copper company continues drifting on the 500-ft. level. This drift is now 100 ft. long. Sinking has been resumed and the shaft will be sunk to the 600-ft. level. P. J. Hickey, Jr., is in charge.

Canon—J. S. Coupal, of New York City, has purchased the old Tip Top property in the southern part of Yavapai County. Years ago this property was famous as a silver mine. After many years of idleness it was reopened during the tungsten boom because the ores carried considerable tungsten. The silver output is said to have been over four million dollars. The mine is developed to a depth of 830 ft. The old camp is being rehabilitated and a new wagon road will be built from Tip Top to Canon.

Superior—The Silver King of Arizona's new shaft is down well below the 600 level and reported in payable ore. The 600-level crosscut toward the old shaft is advancing in ground containing stringers of high-grade silver ore.

Ray—Sinking has been resumed at the Arizona & Butte mines on the western side of the camp. A new 300-ft. Sullivan air compressor and four Sullivan jackhamers have been purchased. It is planned to sink an additional 500 ft., giving a total depth of 1,000 ft. Crosscuts will be driven at intervals of 100 ft.

The Poland Copper Co., financed by Pittsburgh interests, has suspended operations for the present.

Chloride—E. N. Phillips, manager, R. C. Ferguson, superintendent, and T. I. Darrough and H. M. Thompson, the principal stockholders of the Molly Gib-

son-Chloride Mines Company, visited the property recently and completed arrangements for further equipment and development.

At the Brunswick mine development is in progress on both the 200 and 300-ft. levels. A crosscut on the 200-ft. level has opened up 15 ft. of ore on the hanging wall side of the vein.

ARKANSAS

Operations in Batesville Manganese District

Cushman—The Page manganese mine near Cushman, owned by Walter Dennison and Stanley Hanford, has been put in operation and is making a good production. A small washing plant has been installed.

The Polk-Southard property, operated by the Independence Mining Co., is being worked steadily. Both mine and washing plant are running.

Batesville—A. O. Potoroff has recently leased the Ozark Mining Co.'s property near Batesville and has it in operation. He is installing a Keystone steam shovel.

Frank Perrin, of Batesville has leased the Adler manganese land comprising about 1,500 acres. Numerous pits have been opened up to a producing stage. One mine on the property is equipped with a modern washing plant.

The Allen property has recently been purchased by the White River Manganese Co., which is remodeling the washing plant and adding more machinery.

CALIFORNIA

North Star Begins Work on New Plan for Storing Tailings—Heroult Mine Shipping Iron Ore to Foundries

Grass Valley—The Norambagua mine will begin work of deepening the main shaft to 1,500 ft. The installation of the 20-stamp mill is proceeding satisfactorily. The mill building and foundations for the machinery are complete, and the mortars are now in place. It is expected that the mill will be running some time within the next five weeks.

The North Star Mines Co. is to construct a new tailings reservoir in the bed of Wolf Creek to impound tailings and slimes from the mill. An artificial channel for the flow from the creek will have to be constructed, work on which is already under way. The new reservoir will make it possible to do away with the present unsatisfactory method of handling tailings by steam shovel.

Angels—The Melones mine equipment has been leased to the W. J. Loring interests. The old Melones tunnel will be repaired, and through it ores will be trammed from other properties to the rock-crusher at Melones, and from there carried to the mill.

The Utica Gold Mining Co. has 40 stamps dropping on ore from the Gold Cliff group. About 225 tons are milled daily.

Redding—The Mountain Copper Co. is producing approximately 400 tons ore daily at the Hornet mine. The product is being sent to the company's chemical plant, where it is valued for its high sulphur content.

The Pittsburg & Mount Shasta Gold M. & M. Co. is pressing the work of sinking the 500-ft. shaft at the Little Nellie mine.

The Mammoth Copper Co. is actively engaged in developing new ground. It is unlikely that the smelter will be blown in until ore reserves approximate those of the pre-war period.

Heroult—The Noble Electric Steel Co., of Heroult, is shipping two carloads of iron ore every week to various foundries of the state. This ore averages 65 per cent iron. The company's electric iron smelter remains closed.

CYANIDE PLANT AND TAILINGS DUMP OF NORTH STAR MINES CO., GRASS VALLEY, CAL.

COLORADO

Matchless Mine at Leadville Again Important as Producer

Leadville—The Matchless mine at Leadville, the source, about forty years or more ago, of the Tabor millions, after many years of intermittent gophering and unimportant production, is again coming to the fore with a rapidly increasing output of silver-lead ores.

A new orebody was broken into on Thanksgiving day last year by lessees operating from the 170-ft. level of No. 6 shaft. Development work since that time has opened up on virgin territory a large body of carbonate ore in blanket formation, the limit of which has not been reached by over 100 ft. of drifting. A 20-ft. upraise failed to reach the top of the orebody.

Nine carloads of ore have been shipped representing the average run of the orebody, showing a return around 26 oz. silver and 17 per cent lead. It is expected that shipments will soon be going forward to the smelter at the rate of a carload of ore per day.

MICHIGAN

Seneca's Second Shipment Better Than First—Baltic's No. 2 Shaft Again Producing—Mayflower Starts Lateral

BY HOMER A. GUCK

Calumet—The second shipment of mineralized material from the Seneca totaled 715 tons and yielded 40,755 lb. of mineral. This makes the average 57 lb. per ton, a betterment by 10 lb. over that of the first shipment, which was 47 lb. The work at the mine is progressing favorably. A third shipment of approximately 700 tons will be made in a few days. Sinking of the shaft continues and has now reached the fourth level. The plat is being cut so that crosscutting to the lode from the level will be under way within a week or ten days.

On the second level, drifting north and south has disclosed good looking rock all the way. The drift to the south has reached the extreme lateral extension but the north drift will continue.

No development is being done on the third level at this time for the reason that concreting of the shaft is under way. There is 140 ft. of concreting to be done at this point, the shaft being in the curve. The skiproad tracks for the permanent ten-ton skips are laid in solid concrete, a job that will be out of the way when the big hoist is put into operation. This permanent skip road is in the footwall of the formation.

On the third level work on the raise up to the level and the crosscut to the formation has been suspended. The lateral is in the vein, not through it.

Unwatering the Gratiot shaft is progressing with greater rapidity than anticipated. The bailers got down to the third level in four days and from the present progress developments at this point may be expected soon.

The diamond drill in search of the Calumet conglomerate lode has been set up at the third location and the sandpipe is now going down. The second hole cut the conglomerate lode and found that it was without copper contents. The formation had all the physical characteristics that were displayed in the first hole.

Baltic—After being out of commission since Dec. 4, 1919, No. 2 shaft of the Baltic mine of the Copper Range Co., resumed shipments of ore Feb. 10. Ordinarily this shaft is the largest producer of ore operating on the main lode. The cave-in at the 11th level was expensive and interfered with the production during all this period. However, the tonnage was made up by increasing the output from Shafts 3, 4 and 5. This latter shaft produced most of the material from the west lode. No. 3 shaft is now at the 37th level.

Houghton—Mayflower has started a rectangular lateral at a point 100 ft. from the shaft and at a depth of 1,710 ft. The drift from the shaft to the north is in 75 ft. The formation continues to have practically all the physical appearances that were shown in the ore formation where encountered in the shaft. It is the average Lake Superior copper ore, carrying values that clearly are worth mining if the formation proves extensive enough. The plan for the crosscut when the drift gets in 100 ft. is based on the idea of further exploring the lode. The lode carries trap just as it did in the shaft proper. The openings from the shaft indicate simply that the lode has flattened just as expected from the drill core results.

Gogebic Range

Ironwood—The Steel & Tube Co. of America has a contract to ship ore to St. Louis, Mo., which is a new market for ores from the Gogebic Range. When the lakes open up the ore will be sent by boat to South Chicago, thence by rail to St. Louis.

In a personal injury case against the Oliver Iron Mining Co. a carpenter by the name of Sahlberg has settled for $11,000 after a circuit court jury awarded him $20,000. The injured man was employed by a sub-contractor engaged in building an engine house for the mining company; he fell from a scaffold and received injuries causing paralysis of his limbs. The mining company was sued on the ground that it did not supply sufficient material to make a safe scaffold.

Influenza has re-appeared on the Gogebic Range and for a week has caused a reduction of 10 per cent or more in working forces at the mines.

The Oliver Iron Mining Co. has made an official announcement of a raise in wages of about 10 per cent for its employees on the Gogebic Range.

Marquette Range

Humboldt—The Wolverine Iron Co. has been formed to take over the property of the Williams Iron Co. The mine is idle at present. Some development work has been carried on during the last two years. The plans of the new owners have not been disclosed.

Ishpeming—This is the last winter that the Lake mine will stock ore. It has been an important producer of high-grade ores for many years. All work will probably be stopped before the close of year. It is one of the oldest working mines of the Lake Superior district and is owned and operated by the Cleveland-Cliffs Iron Co. An effort is now being made by the company to find another ore deposit in the Ishpeming field. Several diamond drills are at work within the city limits.

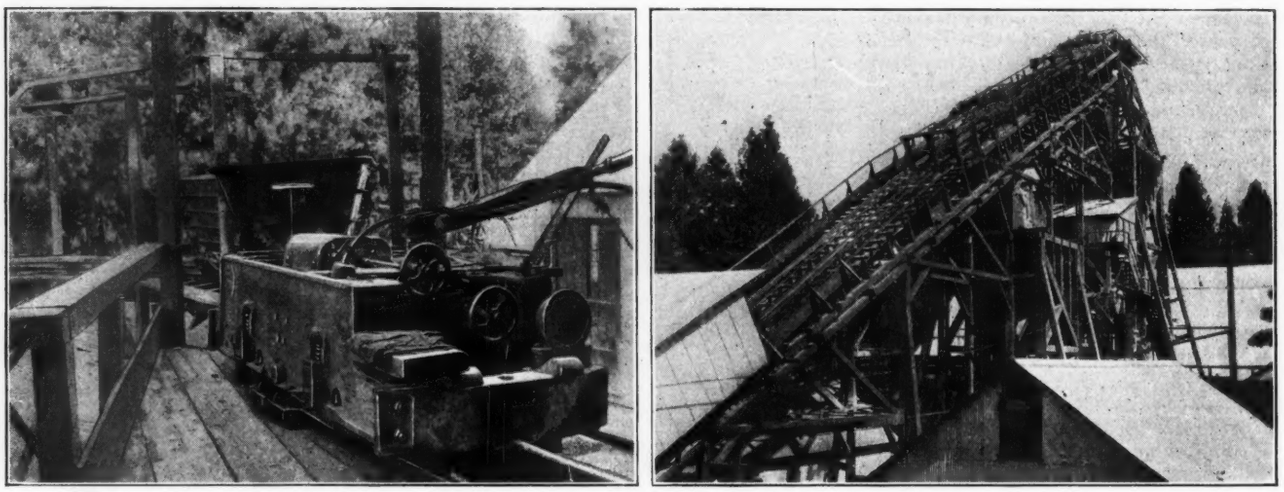
Excellent progress is being made in driving a long drift to the Barnes-Hecker property. It will be over 6,000 ft. long. An Armstrong loader is being used to handle the broken rock.

Menominee Range

Crystal Falls—Operations at the Tobin mine are to be resumed by the McKinney Steel Co. after a shut down of over a year. The workings were kept free of water and it will not be long before the full crew will be underground. A new level is to be opened. An electric pump was recently installed. Many former employees who left the range are returning to Crystal Falls.

Hoisting of ore has been resumed at the Carpenter. Four months were required to clean out the workings after the cave-in of last September. It was a difficult task to make the mine safe for the miners. The water in the sand overburden had to be stopped. When it had been conquered bulkheads were installed to hold the sand back. One new level has been opened up. This will be one of the largest producers on the range in 1920.

Iron River—An addition is being made to the power house of the Peninsula Power Co., which has been called upon to deliver more current.



LEFT—ELECTRIC HAULAGE AT NORTH STAR MINES, GRASS VALLEY, CAL., BETWEEN CENTRAL SHAFT AND STAMP MILL. RIGHT—CENTRAL SHAFT, SHOWING SURFACE EQUIPMENT

MONTANA

Emma Mine Shipping Manganese to Great Falls—Silver Mining Active in Other Districts

Butte—Shipments of manganese ore have been resumed from the Emma mine of the Butte Copper & Zinc company, which Anaconda is operating under a 50-50 profit-sharing plan. One hundred tons daily is going to Anaconda's ferro-manganese plant at Great Falls, from which is obtained 40 tons of ferro-manganese. A large tonnage of manganese ore has been blocked out at the Emma running 37 per cent manganese and 6 per cent silica. Anaconda is operating its mines at approximately 80 per cent capacity. The zinc plant

at Great Falls is expected to be running at capacity by Mar. 1.

North Butte's ore production will shortly increase, according to company officials. The hoisting plant at the Speculator shaft has been overhauled. Through the Granite shaft 2,000 tons is being hoisted daily and the tonnage to be raised through the Speculator is expected to boost the output to about 3,000 tons.

The crosscut on the 2,700-ft. level of the Colorado mine of the Davis-Daly company is in about 500 ft. with about 800 ft. to go to reach the No. 2 vein, the largest fissure on the 2,500-ft. level. Two or three veins will be cut this side of the No. 2, the first of which is expected to be reached within a month. Construction of new ore bins is under way and the new framing plant is nearing completion. Gasoline locomotives have replaced horses in tramming ore on the surface from the mine to the railroad bins. A hundred tons of silver-lead ore is being shipped daily from the Hibernia mine, this going to the East Helena smelter of the American Smelting & Refining Co.

The orebody recently opened on the 1,200-ft. level of the Main Range mine of the Tuolumne Copper Mining Co. shows a width of 20 ft., netting about $12 from the smelters. Shipments are being increased. Crosscutting is proceeding on the 1,200-ft. level with the Rory O'More vein as the objective.

The Butte Metals company, recently organized by the Hayden Stone interests, is doing development work at the Otisco and Mary Louise shafts, south of the Davis-Daly. About four feet of ore was recently cut on the 200-ft. level of the Otisco, from which shipments will be made soon.

A hoisting plant has been installed on the Mapleton claim of the Butte & Plutus company and ore is being hoisted from a recent strike on the 100-ft. level.

Neihart—The Cascade Silver company will show net earnings of approximately $80,000 for January and February.

The Neihart Silver company is increasing its ore shipments and is expecting to show returns of around $20,000 monthly.

The Ripple Silver company is shipping at the rate of $10,000 monthly. About six feet of ore was opened recently in this property.

Potomac—The No. 4 crosscut tunnel has about 600 ft. to go before it will be under the Copper Cliff. Stringers showing glance and native copper have been cut in a number of places. No. 3 tunnel will be under the Leonard group of claims by the middle of March at about the same time the No. 4 is under the Copper Cliff.

Clancy—The Legal Tender company is expecting to ship several cars of high-grade ore. Stopes on lower levels, though narrow, are running high in silver.

The Liverpool Mines made shipments of silver ore during January showing earnings of several thousand dollars over expenses.

Underground development at the Amalgamated Mines is proceeding satisfactorily and silver ore is being shipped to the East Helena plant of the A. S. & R. Co.

Elkhorn—At the Boston & Montana Development Co.'s property the high-grade ore opened in the Blue Jay vein on the 300-ft. level is holding up and is yielding about 30 tons daily. It is expected that the Park vein on this level will be reached soon. Ore is being shipped to the smelter.

NEW MEXICO

Burro Mountain Mill Rebuilt—Republic M. & M. Co. Sold to Empire Zinc Co. —Fluorspar Strike Near Mesilla

Hot Springs—The Grass Roots Gold & Copper Co., which was organized about 60 days ago, is taking good ore from its property in the Cabellos Mountains. El Paso people are interested. C. J. Huskey is general manager for the company.

Kingston—The Gray Eagle Co. has begun shipments again from its property on South Percha Creek.

The O. K. mine has completed a winze sunk from the main tunnel.

The Lookout and the Log Cabin mines are working full force.

Lake Valley—Stauber and Wright are working 25 men and have recently opened a new orebody. During December, 1,400 tons averaging about 10 oz. silver was shipped. Several lessees are working and a general store has been opened.

Tyrone—The Burro Mountain Branch of the Phelps-Dodge Corporation has practically completed rebuilding its mill. All equipment will be new. About 550 men are working regularly upon development. Previous to closing down the mill, from 2,000 to 3,000 ft. of development work had been done per month; since then this has been increased to about 9,000 ft. per month. Large bodies of milling ore have been blocked out in the last year.

Hanover—On Feb. 6 public announcement was made of the consummation of the sale of the Republic Mining & Milling Company's property to the Empire Zinc Company. The consideration was in excess of $500,000 cash. The Republic company's holdings adjoin those of the Empire Zinc Co. at Hanover and consist of approximately three hundred acres of land rich in zinc. The Republic company was organized about four years ago and was financed by Grant County people.

Mesilla—A new strike of fluorspar is reported from the Tortuga Mountains, five miles east of Mesilla. The vein is reported to be from 2 to 12 ft. wide and traceable for 1,500 ft., and of good shipping ore. Eighteen men are at work, the ore being transported to the foot of the mountain by burros, thence to the Santa Fé railway by wagons. Alfred Roos, of Tucson, Ariz., is in charge.

OKLAHOMA

Anna Beaver's New Ore Bins—Hunt Mill Near Picher Burned Feb. 6; Will Be Re-Built

Tar River—The Anna Beaver Mining Co. is planning to try out a surface concrete ore bin of a new style for this district, at its property north of Tar River, Okla. The No. 3 mine of this company is not as yet equipped with a mill and is about 2,100 ft. from the No. 2 mine and mill. It is planned to build a surface railroad connecting the two, and, because the mill is equipped with skips for hoisting, to dump the ore into a surface hopper from the railroad. The hopper is to have a slanting floor, the depth ranging from 2 ft. at the outward side to probably 30 ft. at the shaft, where a pocket will be cut for the loader. The dirt then can be loaded by gravity from the hopper to the skips for elevation to the mill hopper. Lee Fillius is the present manager for the Anna Beaver company in this field, he having succeeded Marshal Draper some time ago. Letters received from Mr. Draper recently state that he is at Rangoon, India, just ready to start on an exploration journey into the heart of Burmah.

Picher—Production has begun at the new mine and mill of the Commonwealth Mining Co., on a lease a short distance northeast of Picher, Okla. The property is owned by E. R. McClelland and associates of Kansas City, who recently moved the St. Regis mill from Joplin to the site.

Fire completely destroyed the mill of the Hunt Mining Co., situated one mile northeast of Picher, Okla., on Feb. 6. The plant was built two years ago at an approximate cost of $150,000, by the Pittsburg-Miami Mining Co., an organization backed by the I. W. Hunt Engineering Co., of Chicago. A few months ago the property was taken over directly by the Hunt company, and has since become a good producer. The origin of the fire is unknown. It was first discovered in the screen room. All miners were brought safely to the surface, some through the mill shaft but the greater part from the field shaft. The office building, boiler house and a derrick at the field shaft were saved. The plant will probably be rebuilt immediately. The main office of the company is 2200 Insurance Exchange Bldg., Chicago, Ill. Robert W. Hunt is president.

UTAH

Vipont Property Reported Sold—Miscellaneous Annual Reports Made to Equalization Board

Salt Lake City—The property of the Vipont Mining Co. in Box Elder County near the Idaho line, the nearest town being Oakley, Idaho, is reported to have been taken over by outside capital. The ore is siliceous carrying silver and gold, and there is a new 200-ton flotation mill on the ground. This property was worked in the early days and has lately been rejuvenated and worked under up to date methods.

The Bingham properties of the United States Smelting Co., according to the report to the state board of equalization, produced 130,911 tons of ore on company account and 1,259 from lessees in 1919. Net proceeds of the lessees were $9,594, and for the company, $156,307.

The South Hecla at Alta reports mining 7,703 tons of ore, which produced 107 oz. gold; 72,029 oz. silver; 51,424 lb. lead, and 361,428 lb. copper. This is valued at $140,299, and cost of extraction is placed at $89,631; reduction, $34,296; and transportation $21,926, making the total cost $145,853.

The Montana Bingham at Bingham reported mining 4,763 tons of ore of which the metallic content was 220 oz. gold; 14,667 oz. silver; 99,051 lb. lead, and 358,212 lb. copper from which the gross yield was $110,390, with total deductible costs of $124,394, leaving net deficit of $15,829.

Eureka—The Chief Consolidated Mining Co., since beginning operations ten years ago, has done in all 125,033 ft. of development work in drifts, winzes, raises, and shaft work, and has produced 453,574 dry tons of ore and has paid $1,606,248 in dividends. During the year ended Dec. 31, 1919, as compared with the year preceding, there was a large increase of income from sales of ore, a larger tonnage of silver ore was mined, more development done, the latter exceeding that for 1918 by two miles. The net income was less, owing to the large increase in development work, smelting, freight, and operating costs. In 1919 the company did 23,844 ft. of work in shafts, drifts, raises, and winzes in Chief ground, and 2,093 ft. in the more recently acquired Plutus ground.

Results in the Plutus grow more promising as work proceeds, though a shipping grade of ore has not yet been discovered there. Total shipments for the year were 63,726 tons of ore, which brought $2,343,826 after payment of smelting, freight, and transportation charges. The metallic content of the ore was 3,752 oz. gold; 2,757,533 oz. silver; 5,979,588 lb. lead; and 15,574 lb. copper. Net profits for the year after payment of all charges were $664,720.

The Eagle & Blue Bell, which is controlled by the Bingham Mines Co., in its report to the board of equalization gave as its production 22,274 tons from which was obtained 1,641 oz. gold; 389,536 oz. silver; 4,908,342 lb. lead; and 4,409 lb. copper. Net proceeds were given as $128,310 after deduction from a gross income of $621,322.

The Centennial-Eureka reports a net income of $19,223, and a gross income of $514,017, from which are taken $252,474 as the cost of extraction, $192,592 for reduction, and $49,727 for transportation. This company mined 21,288 tons of ore, which produced 7,458 oz. gold; 230,007 oz. silver; 54,712 lb. lead, and 601,567 lb. copper.

The Victoria, owned by the Bingham Mines, reported a gross revenue of $101,637 from 4,121 tons of ore and deductible costs of $89,195, leaving net proceeds of $12,442. The mine produced 735,984 lb. lead; 16,844 lb. copper; 61,008 oz. silver; and 551 oz. gold.

A statement by the Tintic Standard to the board of equalization gave the production as 49,148 tons of ore dry weight, the metallic content of which was 1,397 oz. gold; 1,829,169 oz. silver; 6,160,473 lb. lead; and 681,301 lb. copper, and which brought a gross revenue of $2,589,928 and, after deductions, $889,722 as net revenue.

CANADA

Ontario

Sale of Buffalo at Cobalt Enjoined—Hollinger's Annual Report—Small Properties Merged at Kirkland Lake

Cobalt—During the week ended Feb. 14 the Nipissing Mines Co. and the Mining Corporation of Canada shipped over 400,000 oz. of bullion from Cobalt. In January the Nipissing mined ore of an estimated net value of $329,401 and shipped bullion from Nipissing and customs ores of an estimated net value of $134,199. The low-grade mill treated 5,839 tons and the high-grade mill 98 tons. Development underground continued to be satisfactory.

Max Morgenstein, a shareholder in the Buffalo who was dissatisfied with certain phases of the recent deal, has taken out an injunction to restrain the sale of the property.

The Kerr Lake produced 108,000 oz. in January and it is stated that the profit was about $1 an ounce.

The Coniagas is considering an option on the Gamey properties in Gowganda. A number of new deals have been reported from this latter camp recently, owing no doubt to the success which is being met with in the development of the Castle property which is now owned and worked by the Trethewey.

Porcupine—The annual report of the Hollinger which will be issued shortly is expected to show a production of about $7,000,000, and despite this large amount the ore reserves will not show any decrease. Operating costs were cut to $4.31 a ton. Five miles of development work was done in addition to a large amount of diamond drilling.

At the annual meeting of the Dome Lake the old board of directors was reelected. The mill treated 4,433 tons of ore and recovered $23,832 or about $5 a ton. The average saving was 78.85 per cent. The broken ore reserves are shown at 2,422 tons, averaging $9.70 a ton.

Kirkland Lake—In Kirkland Lake a number of deals involving undeveloped properties have recently been put through. W. Green, of Toronto, with Buffalo and Chicago associates, now controls the Green Kirkland, the Kirkland Combined, the Kirkland Gold Fields and the Malouf Sesikinika, all of which properties have at least pleasant sounding names.

Gowganda—As a result of recent rich discoveries and the prospect that railway transportation and sufficient electric power will soon be available, the Gowganda silver field is attracting increased attention. There are numerous prospective purchasers making inquiries and claim-holders are asking advanced prices for their properties. A very active period of development is anticipated as soon as the weather becomes favorable. A considerable portion of the generating equipment of the South Bay Power Co. has been shipped in and the plant for the development of 250 hp. is expected to be installed by Aug. 1.

AUSTRALIA

Hampden Cloncurry and Mount Morgan Experimenting with Leaching

Hampden Cloncurry—The difficulties under which Australian mining ventures are laboring are illustrated by the recent vicissitudes of the Hampden Cloncurry Copper Mines, Ltd., Kuridala, North Queensland. During the half year ended Aug. 31, 1919, practically no work was done, owing to strikes. A little later, however, operations were recommenced, and as a better class of men was offering than previously, the outlook improved. A new award of wages soon dissipated the bright hopes of the management, which has now to provide an extra $115,000 per annum in wages, or in other words to face an increase of $16.80 per ton in its copper production costs. The loss on the last half-year's work, allowing $63,050 for depreciation, was $115,735, and for the previous term was $334,365.

The company has 218,000 tons of ore, containing 13,020 tons of copper, in reserve, and in addition to smelting its own ore has been making extensive experiments with leaching. These are in abeyance at present, pending the delivery of further equipment. The surplus of liquid assets over liabilities at the end of last half-year was $500,040, exclusive of shares in other companies, for which $199,685 had been paid.

Mount Morgan—The output for the half year ended Nov. 3 totalled 142,004 tons being about 40,000 tons below normal owing to the strike of transport workers in June and July. Of this quantity 54,000 tons was sent direct to the smelters and 84,000 to the concentrator. The milling ore averaged 2.05 per cent copper and 5.63 per cent gold. The mill recovery was 94.27 per cent of the copper and 79.23 per cent of the gold. A leaching plant with a capacity of one ton per day has given encouraging results and a ten-ton unit is now being installed for further experiments; It will leach the copper from the calcines and recover the gold from the residues by chlorination.

The total revenue for the year was $2,479,910. The total expenditure, including development, depreciation, etc., was $2,013,240 leaving a surplus of $466,670, of which $250,000 was absorbed by dividend paid on Sept. 30. A further $250,000 has since been distributed to shareholders. The net liquid assets were valued at $2,718,660. The average price realized for copper during the term was $484.50 per ton.

MEN YOU SHOULD KNOW ABOUT

Frank Merricks has been elected president of the London Institution of Mining and Metallurgy for 1920.

E. M. Hamilton, of San Francisco, has gone to El Oro, Mexico, and expects to be absent about two months.

Granville Poole, government mine inspector, has been appointed to the chair of mining at Leeds University, England.

D. E. Sutherland, assistant general superintendent for the Oliver Iron Mining Co., returned on Feb. 10, from a month spent in Florida.

Otto C. Davidson, general superintendent for the Oliver Iron Mining Co. on the Menominee and Gogebic ranges, is at Miami, Fla., for his health.

C. R. Olson, mill superintendent for Como Consolidated Mines Co., has resigned to accept a similar position with the Kansas City-Nevada Consolidated Mines Co., Bruner, Nev.

E. H. Dudley and **L. V. Lawhed** of the Phelps-Dodge Corporation, Morenci, Ariz., have been in the Lordsburg, N. M., district where they have been making examinations of mineral properties.

F. K. Ovitz, superintendent of the Seattle station, U. S. Bureau of Mines, has resigned to accept a position as fuel efficiency engineer with the Standard Oil Co. He will be located at Whiting, Ind.

U. B. White, formerly with the administrative force of the U. S. Bureau of Mines experiment station work, has resigned to become assistant secretary of the American Chemical Society in Washington.

E. M. Bond, formerly metallurgist and chemist of the American Platinum Works, Newark, N. J., resigned his position recently to accept similar duties with the Interstate Smelting & Refining Co., Newark, N. J.

C. R. McCollom, lately returned from service in France, has resumed practice in mining engineering and applied geology, particularly in the petroleum industry. His address is 624 Consol. Realty Bldg., Los Angeles, Cal.

Roy B. Earling, 55 Congress St., Boston, has resigned his position as superintendent of the Metcalf division, Arizona Copper Co., Ltd., and has accepted a position with the U. S. Smelting, Refining & Mining Co., Boston, Mass.

George E. Burton has resigned his position of resident geologist for the Empire Gas & Fuel Co., to join the geological staff of the East Butte Copper Mining Co. The latter is exploring for oil and gas in the mid-continent field, and has its offices at 1216 Colcord Bldg., Oklahoma City, Okla.

M. M. Duncan, of Ishpeming, Mich., vice-president and general manager of the Cleveland-Cliffs Iron Co., is spending a few weeks in St. Augustine, Fla.

J. T. Cargill, chairman of Burmah Oil Co., Ltd., was among those receiving the Order of the Bath, K. C. B., in the first list of New Year Honors, Jan. 1, 1920.

E. Perry Crawford, of Culican, Sinaloa, Mexico, has returned to Silver City, N. M., after a six-months' stay in Mexico. He reports conditions about Culican as safe and quiet. He expects to return in a short time to continue work on silver properties now under the direction of his partner.

Daniel C. Jackling was awarded a Distinguished Service Medal in recognition of his services as war-time Director of Explosives. The award was recommended by the board charged with such awards, and was approved by Secretary N. D. Baker who had personal knowledge of the high character and the patriotic spirit of the recipient.

OBITUARY

John Langston, of New York, consulting electrical engineer for the Inspiration Consolidated Copper Co., died on Feb. 9, of pneumonia at Miami, Ariz., while on a tour of inspection.

Albert W. Tomlin, recently named State Mine Inspector of Arkansas, died at his home in Greenwood, Ark., on Feb. 4, from pneumonia following an attack of influenza. He was but 35 years of age.

J. T. Hillis, well-known among British Columbia mining men, died recently. Mr. Hillis went to the province from Montana in 1900, and with his partner did the difficult preliminary development work on what is now the Britannia mine. Later he was identified with the group of claims that developed into the Hidden Creek Mines of the Granby Consolidated Mining & Smelting Co., Anyox, B. C.

INDUSTRIAL NEWS

Edgar Zinc Co., Saint Louis, Mo., announces that its officers for the year are: A. S. McMillan, president; J. S. Keefe, vice-president; John Davis, secretary-treasurer; and L. B. Schneider, auditor.

Wheeler Condenser & Engineering Co., Carteret, N. J., has improved its devices by using a vertically split casing about the tail pump, thereby securing easy and quick removal for inspection of the pump rotor or other internal part. This improvement is now being added to both types of condensers.

International Motor Co. points out through its vice president R. E. Fulton, that the next stage in the development of highway transportation will be freight terminals designed and operated exclusively for motor trucks in the large cities of the United States. At present this company also has an order for six trucks to be used by an American contracting firm working in Tokio on a five-year contract. Japan is said to be using an increasing number of motor trucks.

Loader. The Jeffrey Manufacturing Co. is also building a new type of self-propelled loader which it calls the Radial Loader. This type, it is claimed, overcomes all the objections to the old type of machine. It has a three-wheel base permitting movement in either straight lines or wide swaths, and will feed itself into a pile of material. The swivelled third wheel and the differential gears on the two-wheel axle, permit keeping the discharge chute stationary while the pick-up end of the extending elevator boom travels in a complete circle or arc thereof. The machine will handle heavy material, pass over soft, rough, or uneven ground and remain stable under all ordinary ground conditions. Power is either electric or gasoline, and two speeds are provided.

NEW PATENTS

U. S. Patent specifications may be obtained from the Patent Office, Washington, D. C., at 10c each.

Amalgamator—Machine for the separation of gold, silver, and platinum from sand. Daniel Diver. (1,329,113; Jan. 27, 1920.)

Copper Leaching. Metallurgical process. William E. Greenawalt. (1,328,666; Jan. 20, 1920.)

Copper Ores—Process of leaching. John J. Nelson. (1,326,463; Dec. 30, 1919.)

Mine-Car Coupling. John A. Bish. (1,326,839; Dec. 30, 1919.)

Mining-Car Wheel. Alfred Bryant Day. (1,326,327; Dec. 30, 1919.)

Oil-Well Pump. Ralph Gregory, assignor to Oil Well Reclamation Co. (1,326,338; Dec. 30. 1919.)

Potash—Method of Digesting Finely-Divided Materials. Thomas C. Meadows and Frank L. Sample, assignors to American Potash Corp. (1,326,412; Dec. 30, 1919.)

Potassium—Process of Obtaining Combined Potassium from Minerals. Samuel R. Scholes. (1,327,782; Jan. 13, 1920.)

Separating Device for Ores. Archie H. Jones. (1,326,453; Dec. 30. 1919.)

Separation of Ores. Alfred Arthur Lockwood. (1,329,127; Jan. 27, 1920.)

Separation—Process and Apparatus for Ore Separation. James D. Ross. (1,328,456; Jan. 20, 1920.)

THE MARKET REPORT

Published simultaneously in San Francisco and mailed from there to our Western subscribers as a special service pending the arrival of the *Engineering and Mining Journal*

Silver and Sterling Exchange

Feb	Sterling Exchange	Silver		Feb.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
12	....	....	88¾	16	335	130	83⅛
13	339½	132	84¾	17	334½	130	84¾
14	345½	131	82	18	335½	130	84

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Daily Prices of Metals in New York

Feb.	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
12	.....	.....	...	.....	.....	.....
13	18⅛@18½	56 @56¼	58¼	8.75@8.80	8.55@8.60	8.60@8.70
14	18¼@18½	56¾	59 @59½	8.75@8.80	8.55@8.60	8.70@8.80
16	18¼@18½	57⅝	59½@59¾	8.75@8.80	8.55@8.60	8.70@8.75
17	18⅜@18⅝	58⅜@58⅞	59¾@60	8.75@8.80	8.55@8.60	8.70@8.75
18	18⅜@18⅝	58⅜@59	60	8.75@8.80	8.55@8.60	8.70@8.80

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Feb.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
12	119¾	122	127	388½	389¼	49¾	50⅝	62½	64⅜
13	119½	121⅞	127½	388¾	389½	49¾	50⅜	61¾	63¾
14									
16	118⅛	120¾	127	389	390½	50½	51⅜	60¾	63
17	119½	121½	127	392	392¾	50⅞	51½	60¾	63
18	119¼	121¾	127	392¼	393½	51¾	52½	62½	64⅞

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

METAL MARKETS

New York, Feb. 18, 1920

During the week the copper market was quiet, and little business was done by large interests, the average price advancing about ¼c. Lead was steady, the New York quotation remaining unchanged, while the St. Louis price was steady at 8.55@8.60c. Zinc advanced slightly over last week, closing at 8.70@8.80c. St. Louis. Transatlantic freights were unchanged. Transpacific freights remained at $12 from Hongkong and Kobe to San Francisco.

Copper

Copper has been very dull during the week, and there has been little or no buying by large consumers, who have been held back by lack of transportation facilities, due largely to congestion resulting from recent storms, and who have experienced much difficulty in some cases by labor shortage due to the epidemic of influenza. Some business has been done by outside dealers at 18⅛@18¾c. and this business is representative of market conditions at this time. Large producers are not meeting the outside market, but are holding firm at around 19c. Export business is reported done regularly at 19c. and a little higher.

Copper Sheets—No change in base price of 29½c. per lb. set early in January. Wire 22¼c. per lb.

Tin

Tin has been very quiet during the week, with practically no domestic market, although quotations for 99 per cent tin were advanced from 56¾c. to 57⅝c. on Feb. 16. Straits tin for future delivery is quoted as follows: Feb. 13, 60c; Feb. 14, 60¾c.; Feb. 16, 60⅛@61c.; Feb. 17, 60¾c.

On Feb. 10, 950 tons arrived from Singapore in addition to the 450 tons previously reported; on Feb. 11, 20 tons and on Feb. 13, 650 tons arrived from Bolivia; on Feb. 14, 800 tons arrived from the Straits and 195 tons from Liverpool.

Lead

Lead has been firm and in pretty good demand, the principal producers maintaining their official price at 8¾c. New York throughout the week. Today prices ranging from 8.57½@8.61¼c. St. Louis are reported to have been obtained for minor quantities, and some small lots were reported sold as high as around 8.65c. St. Louis, and 9c. New York. Canadian consumers have been liberal purchasers of Mexican bonded lead at around 8c., and during the latter part of the week London has been a buyer of bonded lead.

Zinc

The London market is firmer. Foreign exporters put in large demands in the belief that the London market would go higher, and this sent the price up around 8¾c. Today's London price shows an advance of £1 15s. per ton over yesterday.

Domestic consumers in some cases during the week appeared to be averse to paying over 8¼c., but producers and dealers refused to part with the metal at that figure.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots. Slightly higher prices for export. Unchanged.

Gold, Silver and Platinum

Gold—Gold has been quoted in London as follows: Feb. 12, 120s.; Feb. 13 and 14, 121s. 6d.; Feb. 16, 121s. 3d ; Feb. 17, 122s.; Feb. 18, 122s. 6d.

Silver—Owing to the approach of the Chinese New Year, the demand from the East has not been so broad, but such amounts as have been for sale have been absorbed for shipment. Some coin is still being refined and put on the London market.

The general stock of money in the United States on Feb. 1 totaled $7,744,769,263; of this, $2,762,905,481 was in gold coin and bullion, $285,221,775 in standard silver dollars, and $232,784,726 in subsidiary silver. The money in circulation on Feb. 1 was $5,846,086,199, or $54.77 per capita.

Silver mining in Canada has been very profitable on account of adverse

exchange rates. Canadian miners are receiving as much as $1.55 per oz. in Canadian currency, because of a premium of about 15 per cent on American money. Cobalt mines are taking advantage of this situation and last week shipped over $600,000 worth of silver bullion.

Foreign Exchange—Was quoted yesterday as follows: The pound sterling at $3.34¾; francs at 14.37 to the dollar; Italian lire at 18.32 to the dollar; German marks at 1.01c. Today the pound sterling is quoted at $3.36.

Henry C. Emery of the foreign department of the Guaranty Trust Co. of New York, in discussing the foreign exchange situation, according to a report in the New York Times of Feb. 18, said there was no mystery about it, for in normal times it was governed by simple principles.

"The old exchange problem was simply the problem of the relative value of funds in different places," said Mr. Emery. "Today it is largely a question of the different values of the funds themselves—that is, of the relative value of different kinds of money. It is no longer determined by purely business conditions. It is affected by political conditions as well."

Mexican dollars at New York: Feb. 12, holiday; Feb. 13, 101½; Feb. 14, 101½; Feb. 16, 100½; Feb. 17, 100; Feb. 18, 100.

Platinum—Market quiet around $150 per oz.

Palladium—$130@$135 per oz.

Iridium—Quoted nominally at $300.

Other Metals

Aluminum — 32@33c. per lb., unchanged.

Antimony — Market is very firm. Sales of ordinary brands, both spot and futures, average about 11¾c. W.C.C., 12c., and Cookson's spot, 14¼c., futures, 13½c.

Bismuth — Unchanged at $2.50 for 500-lb. lots.

Cadmium — Unchanged at $1.40@$1.50 per lb.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c. Unchanged.

Quicksilver—Fair demand at $85 per 75-lb. flask. San Francisco wires $83, firm.

Other Ores and Minerals

Chrome Ore—75c. per unit for 50 per cent ore. Some Indian ore on the market at this price.

Manganese Ore — Demand is active with price up to 80c. per unit for high-grade ore.

Molybdenum Ore—70@75c. per lb. MoS_2 for high-grade concentrate.

Tungsten Ore—Chinese wolframite is being sold at from $6@$6.25 per ton according to grade. Little other ore sold.

Barytes—White, $34@$36 per ton; off-color, $22@$28 per ton.

Graphite—Ceylon grades are quoted unchanged: Lump, 15@16c.; chip, 11@12c.; dust, 8@9c. Domestic flake about 10c. per lb. Mexican and Korean ore running 80@85 per cent amorphous carbon brings about $55@$60 per ton.

Nitrate—$3.85 per cwt.

Fuller's Earth—Domestic, $15 f.o.b. New York state.

Feldspar — $13.50@$18 f.o.b. mines, Tennessee and New York.

Fluorspar—Lump ore containing 85 per cent CaF_2 and not over 5 per cent SiO_2 is quoted unchanged at $16 f.o.b. mines at Tonuco, N. M.

Pyrites—Spanish pyrites is quoted at 16c. per unit for furnace-size ore, free from fines, c.i.f., Atlantic ports.

Sulphur—Prices average $18 per ton for domestic and $20 for export, f.o.b. Texas and Louisiana mines. Practically no change in past two or three months. Export demand falling off on account of exchange and domestic consumers are largely booked for the year.

Zinc and Lead Ore Markets

Joplin, Mo., Feb. 14—Zinc blende, per ton, high, $54.10; basis 60 per cent zinc, premium, $51; Prime Western, $47.50@$50; fines and slims, $47.50@$45; calamine, basis 40 per cent zinc, $35. Average settling prices: blende, $51.02; calamine, $36; all zinc ores, $50.95.

Lead, high, $102.40; basis 80 per cent lead, $100; average settling price, $98 94 per ton.

Shipments the week: Blende, 12,202; calamine, 62; lead, 2,764 tons. Value, all ores the week, $898,280.

Shippers of both zinc and lead this week diverted an unusually large number of cars to moving lead to fill a marked shortage at the smelters. Offerings for zinc blende began the week at $47.50, but found few sellers. An advance to $48 found a few more sellers and likewise $49 basis, but not until $50 basis was offered was there any perceptible amount of ore changing hands.

Platteville, Wis., Feb. 14 — Blende, basis 60 per cent, $54 base for premium grade and $51 base for Prime Western grade. Lead ore, basis 80 per cent lead, $100 per ton. Shipments for the week are blende, 1,459; calamine, 60; lead, 334 tons. For the year to date totals are: Blende, 10,541; calamine, 510; lead, 1,083; sulphur ore, 30 tons. During the week 2,213 tons blende was shipped to separating plants.

Iron Trade Review

Pittsburgh, Feb. 17, 1920

From the appearance of the iron and steel market it would seem that steel is scarcer than ever, and fancy prices are still being bid for small prompt lots. In regard to late deliveries, the U. S. Steel Corporation and at least two independents stand by the stabilized prices, although not on the same level, and the other sellers cannot be said to be in the market at all. The monthly report of steel-ingot production, issued last week for the first time since August, 1919, showed production in January at the rate of about 40,600,000 tons a year. Thus the industry is still running much below its capacity, and the trade is looking for better conditions.

Transportation conditions do not show much improvement, although many promises are made by the railroads that with the end of the winter a marked uplift for the better will be shown. Steel consumers hope this is all true, as the distribution of steel now stocked in the warehouses of the mills would help the trade materially.

Pig Iron—The furnaces are doing slightly better than in January, and the indications are that the output of merchant pig iron in this district will make a better showing than last month. There is a higher demand for prompt iron, there being little doing in early deliveries. A substantial premium could be secured for prompt delivery. The bessemer pig-iron market is quiet this week, there being little tonnage movement. In the buying movement of the last week bessemer iron did not go above $42, Valley; basic advanced to $43 under much heavier pressure.

Spiegeleisen — Active at $55 f.o.b. Maryland and $60 f.o.b. buyer's works, Pittsburgh district.

Steel

Steel—There is a good demand for plates, and a fairly large producer who has been a conservative seller was quoting as high prices as seems possibly obtainable, 3.50c., and higher on fair-sized lots, but this seller is now out of the market, having been well sold up. The general plate market is quoted at 3.50c.@4c. Sheet bars continue around the $65 to $70 mark; the small bessemer billets bring $60 or a little over.

Coke—There has not been any broadening of the Connellsville coke market. What production there is seems to be going out on contract, leaving hardly anything to be offered in the market for purchase. Although there is little activity, there is at least a market, rather well defined, at the Government limits, $6 for furnace and $7 for foundry. Furnaces have been very well supplied with coke for a week or more, compared with previous service, but in no case has it been satisfying. A few of the operators who are optimistic in their thoughts of the future are canvassing the market for prospects in the second half of the year, and seem to be well pleased with their success. They look for $10 coke and believe that pig iron will go much above $45.

Ferroalloys

Ferromanganese—Quoted as high as $170 per ton, f.o.b. buyer's works, Pittsburgh district. $155@$165 f.o.b. Maryland.

Ferrosilicon—There is no change from last week, electrolytic remaining steady at $80 for 50 per cent and $140 for 75 per cent delivered. Bessemer ferrosilicon remains at $59.50 for 10 per cent, $62.80 for 11 per cent, and $66.10 for 12 per cent, f.o.b. Jackson, Ohio.

MINING STOCKS

Week Ended Feb. 14, 1920

Stock	Exch.	High	Low	Last	Last	Div.
COPPER						
Adventure	Boston	1	1	*95		
Ahmeek	Boston	70	68	86½	Dec. '19,	$1.00
Alaska-B.C.	N. Y. Curb	1/16	1/8	1/8		
Algomah	Boston	42	42	42		
Alloues	Boston	35	31	35	Mar. '19,	1.00
Anaconda	N. Y.	57⅞	54	57	Feb. '20,	1.00
Ariz. Com	Boston	12⅛	11	11½	Oct. '18,	.50
Big Ledge	N. Y. Curb	⅛	7/16	⅛		
Bingham Mines	Boston	6¼	6¼	6¼	Sept. '19,	.25
Butte & Bal	Boston			‡*25		
Butte & Lond	Boston Curb	16	12	†12		
Calaveras	Boston Curb	1⅛	1			
Calumet & Ariz	Boston	60⅝	59	60	Dec. '19,	.50
Calumet & Hecla	Boston	365	351	360	Dec. '19,	5.00
Can. Copper	N. Y. Curb	1 7/16	1⅛	1¼		
Centennial	Boston	13	13	13	Dec. '18,	1.00
Cerro de Pasco	N. Y.	50¼	45½	49⅞	Dec. '19,	1.00
Chile Cop	N. Y.	17¼	15⅛	17		
Chino	N. Y.	37	33⅛	36⅞	Dec. '19,	.75
Cop. Range	Boston	43½	42	42½	Dec. '19,	.50
Crystal (old)	Boston Curb	*9	*4	†*4		
Crystal Cop	Boston Curb	*35	*22	†*28		
Daly-West	Boston	3⅞	3⅞	3⅞		
Davis-Daly	Boston	11	9¼	10½	Dec. '19,	.50
East Butte	Boston	13½	11⅞	12½	Dec. '19,	.50
First Nat'l	Boston Curb	*1⅜	*1⅛	†*1¼	Feb. '19,	.15
Franklin	Boston	3⅜	3¼	3¼		
Granby Consol	N. Y.	43½	38	38	May '19,	1.25
Greene-Can	N. Y.	34	29¾	32	Feb. '19,	1.50
Hancock	Boston	4⅛	4⅛	4⅜		
Helvetia	Boston	3	2⅜	2½		
Houghton	Boston Curb	*75½	*75	†*75		
Howe Sound	N. Y. Curb			†3½	Jan. '20,	.05
Inspiration Con	N. Y.	53	50¾	53	Jan. '20,	1.50
Iron Cap	Boston Curb	12	9½	†10	Feb. '19,	.25
Isle Royale	Boston	32⅛	30½	31½	Sept. '19,	.50
Kennecott	N. Y.	29⅜	27⅜	29⅜	Dec. '19,	.50
Keweenaw	Boston	1⅜	1⅜	1⅜		
Lake Copper	Boston	4	3½	3½		
La Salle	Boston			‡3		
Magma Chief	N. Y. Curb	30	25	30		
Majestic	Boston Curb	*17	*17	†*17		
Mason Valley	N. Y. Curb	2⅜	2⅛	2⅜		
Mass Con	Boston	4⅜	4⅜	4⅜	Nov. '17,	1.00
Mayflower	Boston	8⅛	7⅞	8		
Miami	N. Y.	22⅛	21⅛	22	Feb. '20,	.50
Michigan	Boston	6⅛	6⅛	6⅛		
Mother Lode(New)	N. Y. Curb	5⅛	5⅛	5⅛		
Nev. Con	N. Y.	15	14⅛	15	Dec. '19,	.37½
New Arcadian	Boston	3⅜	3	3		
New Baltic	Boston Curb	4	3⅜	†3⅜		
New Cornelia	Boston	20	19¼	19¼	Nov. '18,	.25
North Butte	Boston	16⅜	15	15⅛	Oct. '18,	.25
North Lake	Boston	*60	*60	*60		
Oneco	Boston Curb			*60		
Ojibway	Boston	2	2	2		
Old Dominion	Boston	32½	30	32	Dec. '18,	1.00
Osceola	Boston	49¼	44½	45	Dec. '19,	1.00
Quincy	Boston	60	56	57	Dec. '19,	1.00
Ray Con	N. Y.	20¼	19⅛	20	Dec. '19,	.50
St. Mary's M. L.	Boston	50	45	50	Dec. '19,	2.00
Seneca	Boston	15	14	14½		
Shannon	Boston	1⅜	1⅜	1⅜	Nov. '17,	.25
Shattuck Ariz	N. Y.	11½	10⅜	10⅜	Jan. '20,	.25
South Lake	Boston	1⅜	1⅜	1⅜		
South Utah	Boston	*14	*14	*14		
Superior	Boston	5	4½	4½	Apr. '17,	1.00
Superior & Boston	Boston	5⅛	4 7/16	5		
Tenn. C & C	N. Y.	10⅜	9½	10⅛	May '18,	1.00
Trinity	Boston	2	1⅜	1⅜		
Tuolumne	Boston	1	0.80	0.85		
United Verd. Ex	Boston Curb	40½	37	†37	Feb. '20,	.50
Utah Cop	N. Y.	73	68⅜	72	Dec. '19,	1.50
Utah Con	Boston	9	8½	8½	Sept. '18,	.25
Utah M. & T	Boston	2⅜	1⅞	2	Dec. '17,	.30
Victoria	Boston	2⅛	2⅛	2⅛		
Winona	Boston	1⅛	1	1		
Wolverine	Boston	18⅜	18⅜	18⅜	Jan. '20,	.50
LEAD						
Hecla	N. Y. Curb	4⅜	4⅛	4⅜	Dec. '19,	.15
St. Joseph Lead	N. Y.	15⅜	15⅜	15½	Dec. '19,	.25
Utah Apex	Boston	2⅛	2⅛	2⅛	Nov. '18,	.25

*Cents per share. † Bid price on Feb. 14. ‡ Feb. 7.

Stock	Exch.	High	Low	Last	Last	Div.
ZINC						
Am. Z. L. & S	N. Y.	17½	15½	17½	May '17,	1.00
Am. Z. L. & S. pf	N. Y.	56½	50	52	Feb. '20,	1.50
Butte C. & Z	N. Y.	8⅛	7⅞	8⅛	Jul. '18,	.50
Butte & Superior	N. Y.	24⅜	22	24¼	Sept. '17,	1.25
Natl. Z. & L	Boston Curb	*8	*7	†*7	May '17,	.02
Success	N. Y. Curb	*6½	*5	*6	July '16,	.03
GOLD						
Alaska Gold	N. Y.	1⅞	1½	1⅞		
Alaska Juneau	N. Y.	2	1⅜	1⅜		
Booth	N. Y. Curb	*6	*5	*6		
Carson Hill	N. Y. Curb			‡24½		
Cresson Gold	N. Y. Curb	2	1⅞	2	Dec. '19,	.10
Dome Ex	Toronto	29½	28	†28		
Dome Lake	Toronto	13½	13			
Dome Mines	N. Y.	11	10½	10⅝	Jan. '20,	.25
Goldfield Con	N. Y. Curb	*15	*10	*13	Dec. '19,	.05
Hollinger	Toronto	7.00	6.80	†6.80	Dec. '19,	.05
Homestake	N. Y.	65	62½	62½	Sept. '19,	.50
Kewanas	N. Y. Curb	*3	*2	*3		
McIntyre Porcupine	Toronto	2.07	2.00	†2.04	Jan. '20	.05
Silver Pick	N. Y. Curb	*14	*9	*14		
Teck-Hughes	Toronto	‡18	‡19			
United Eastern	N. Y. Curb	4	3⅜	4	Jan. '20,	.21
White Caps	N. Y. Curb	11⅛	9⅜	11		
Yukon Gold	Boston Curb	*1⅜	*1⅛	†*1⅛	June '18,	.02½
SILVER						
Adanac	Toronto					
Bailey	Toronto	6	5½	†5⅛	Apr. '16,	.05
Beaver Con	Toronto	63½	63	†62		
Coniagas	Toronto			†3.00	Nov. '19,	.12½
Crown Reserve	Toronto	39	37	†37	Jan. '17,	.05
Hargraves	Toronto	4¼	3¼	†3¾		
Kerr Lake	Boston	4¼	4	4	Sept. '19,	1.00
La Rose	N. Y. Curb	⅜	5/16	5/16	Apr. '18,	.02
McKinley-Dar	N. Y. Curb			‡*65	Jan. '20,	.03
Nipissing	N. Y. Curb	10⅜	9½	10	Jan. '20,	.50
Ontario Silver	N. Y.	7¼	6½	7	Jan. '19,	.50
Ophir Silver	N. Y. Curb	1⅜	1⅜	1⅜		
Peterson Lake	Toronto	21	20½		Jan. '17,	.01¼
Sil. King Ariz	N. Y. Curb	1/16	1/16	1/16		
Temiskaming	Toronto	43	42	†42	Jan. '20,	.04
Trethewey	Toronto	46	44	†45	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb	*3	*2	*3		
Batopilas	Boston	1⅛	1	1⅛		
Bost. & Mont	N. Y. Curb	*70	†67	*69		
Cashboy	N. Y. Curb	*8½	*7	*8		
El Salvador	N. Y. Curb	3⅛	2⅜	3		
Goldfield Merger	N. Y. Curb	*4	*3⅛	*4		
Jim Butler	N. Y. Curb	*24	*22	*24	Aug. '18,	.07
Jumbo Extension	N. Y. Curb	*7	*6	*7	June '16,	.05
Louisiana Con	N. Y. Curb	5/16	1/8	5/16		
McNamara	N. Y. Curb	3/16	3/16	3/16		
Tonopah-Belmont	N. Y. Curb	2⅛	2⅛	2⅛	Jan. '20,	.05
Tonopah Ex	N. Y. Curb	2⅛	2⅛	2⅛	Jan. '20,	.05
Tonopah Mining	N. Y. Curb	2⅛	2⅛	2⅛	Oct. '19,	.15
West End Con	N. Y. Curb	2	1⅞	2	Dec. '19,	.05
SILVER-LEAD						
Caledonia	N. Y. Curb	*37	*34	*35	Jan. '20,	.01
Fed. M. & S	N. Y.	11	11	11	Jan. '09,	1.50
Fed. M. & S. pf	N. Y.	30½	27½	28	Dec. '19,	.50
Iron Blossom	N. Y. Curb	½	½	½	Jan. '20,	.02½
Marsh Mines	N. Y. Curb	*22	*19	*22		
Rex Con	N. Y. Curb	*8	*7	*7½		
Simon S. L	N. Y. Curb			‡*1		
Stand. S. L	N. Y. Curb	¼	¼	¼	Oct. '17,	.05
Wilbert	N. Y. Curb	*6⅞	*6	*6⅞	Nov. '17,	.10
NICKEL-COPPER						
Internat'l Nickel	N. Y.	22	19¾	21⅜	Mar. '19,	.50
Internat'l Nick. pf	N. Y.	88	87	87	Feb. '20,	1.50
QUICKSILVER						
New Idria	Boston	6	5¼	5¼	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb	12	10	†10		
VANADIUM						
Vanadium Corpn	N. Y.	50	42	47½		
GOLD AND PLATINUM						
So. Am. G. & P.	N. Y. Curb	8	6⅞	8		
MINING, SMELTING AND REFINING						
A. S. & R	N. Y.	63½	56	62⅜	Dec. '19,	1.00
A. S. & R., pf	N. Y.	96⅜	93¾	93¾	Dec. '19,	1.75
Am. Sm. pf., A	N. Y.	80½	80	80	Jan. '20,	1.50
Natl. Lead	N. Y.	78½	73½	75⅞	Dec. '19,	1.25½
Natl. Lead, pf	N. Y.	108½	106½	107½	Dec. '19,	1.75
U. S. Sm. R. & M.	N. Y.	67	61½	64½	Jan. '20,	1.50
U. S. Sm. R. & M., pf	N. Y.	45½	44¾	44¾	Jan. '20,	.87½